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Remodeling a Core Making Department

The Possibilities of Rearrangement of an Existing Plant Shown in Changes at Works of the American Blower Company

The small foundry employing ten or less core makers is inclined to think that its problem is not large enough to warrant calling in outside help to assist in planning or re-arranging the department. The American Blower Company, however, decided to see if it could not increase the efficiency of the core making department in its works at Detroit. The idea was to include the following points as desirable factors in the efficiency work: 1, the reduction of lost castings by the making of more perfect cores; 2, the reduction of machine work and finishing work on castings by more perfect cores; 3, the saving of broken or burnt cores by more carefully controlled baking conditions and planning the handling and storage of cores on a more efficient basis.

The plant was originally built as a soil pipe foundry, and later was changed, and the ovens were added to piecemeal until there existed two large ovens, each arranged so a car could be run in from the front. There were also racks on the walls of the ovens which had to be filled before the cars were run in. There was also a battery of three small ovens of the drawer type. Each of the large ovens was fired from a separate fire pit and

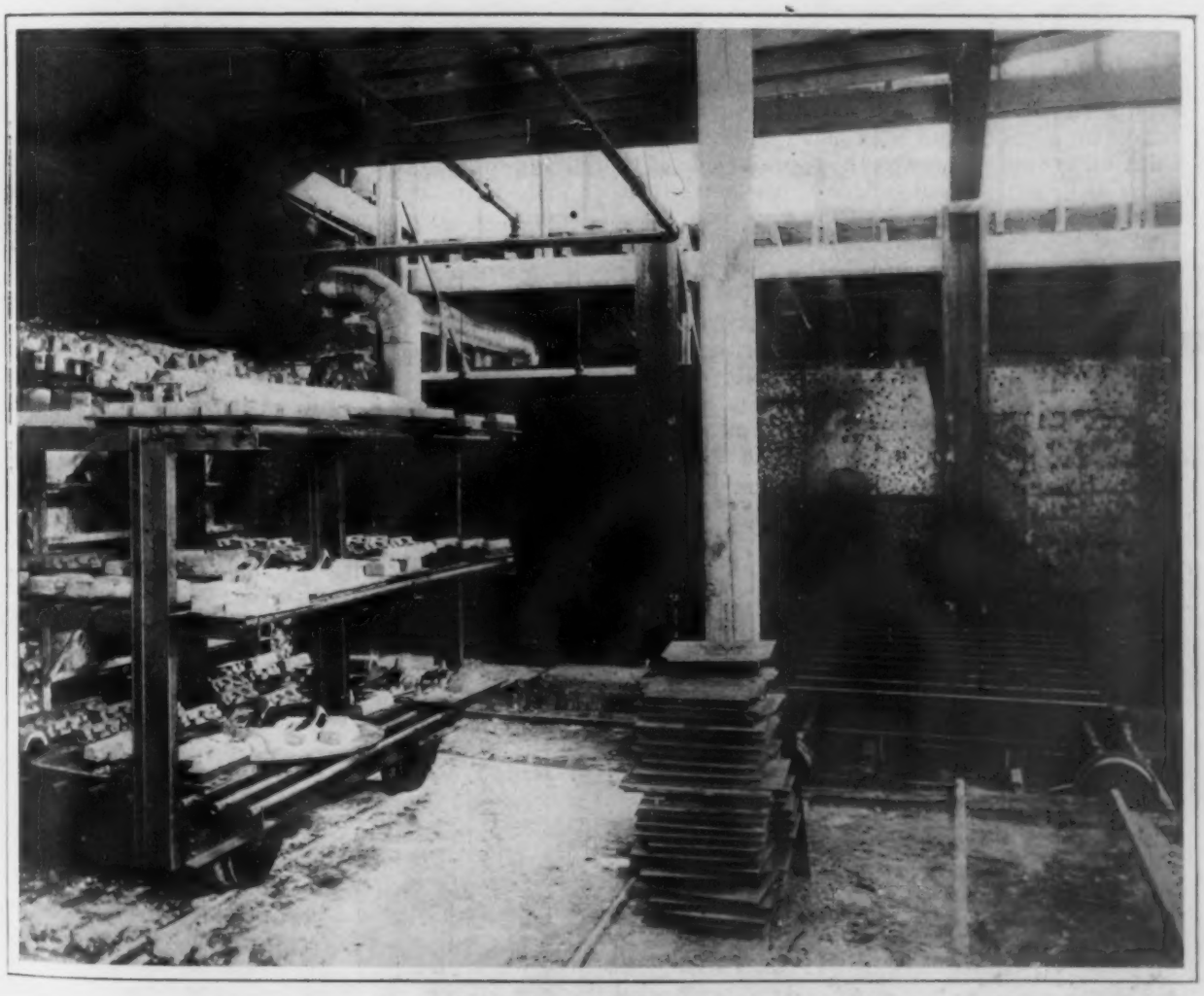


Fig. 1—Front of Core Ovens Showing Transfer Pit

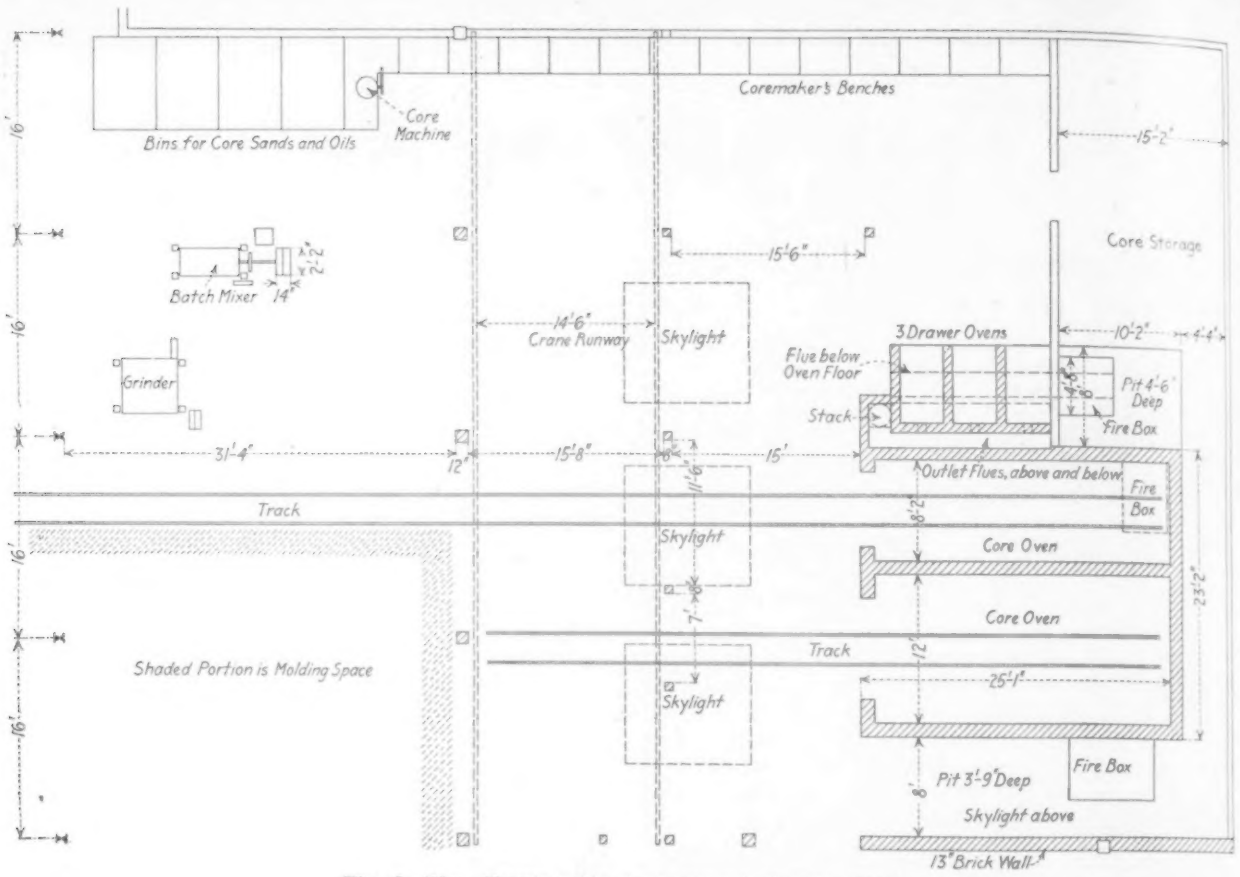


Fig. 2—Plan Showing Old Arrangement of Core Room

had its own stack. The drawer ovens were fired from a third fire pit. In order to provide core storage an addition had been made to the building, which unfortunately was on the opposite side of the core room from the foundry. This necessitated carrying baked cores through the core room to the foundry. The core makers themselves delivered all cores to the ovens and looked after their own supplies.

In the new arrangement the object was to relieve the core makers of as much laboring work as possible, so as to make it possible for the core maker to be on work requiring skill the entire time. The old arrangement of the plant is shown in Fig. 2 and the new arrangement in Fig. 3. It should be noted that the two large ovens have been replaced by three smaller ones, which occupy only about one-half of the area formerly taken up by the large ovens. One of the large ovens was arranged with a fire box under it while the drawer ovens were fired from an external fire box. For the new arrangement the big fire pit with its large area for coke storage next to one of the large mold ovens, was filled up and the space used for a cooling track where cars of hot cores could be run to cool.

Arrangements were made to fire all six ovens, i.e., the three drawer ovens and the three car ovens, from one fire pit. This is not possible with natural draft, but a forced draft system, patents for which have been applied for by H. M. Lane, was installed. The system aims to make it possible to control the rate of combustion, and hence the rate of generation of heat, and also to determine just where and how the heat shall be delivered.

Fig. 4—Monitor Over Core Ovens Showing Door Mechanism

A front view of the car ovens, with the transfer pit and doors, is shown in Fig. 1. This view was taken before the main part of the core room was concreted, and does not show the rearrangement of the drawer ovens which are at the left behind the core car. The core oven doors are of substantial construction, having 2 in. of asbestos air-cell packing in the interior. The doors are free in the guides, but are locked back against the door frames by suitable locking cams. To provide head room for the door operating mechanism and also to give ventilation

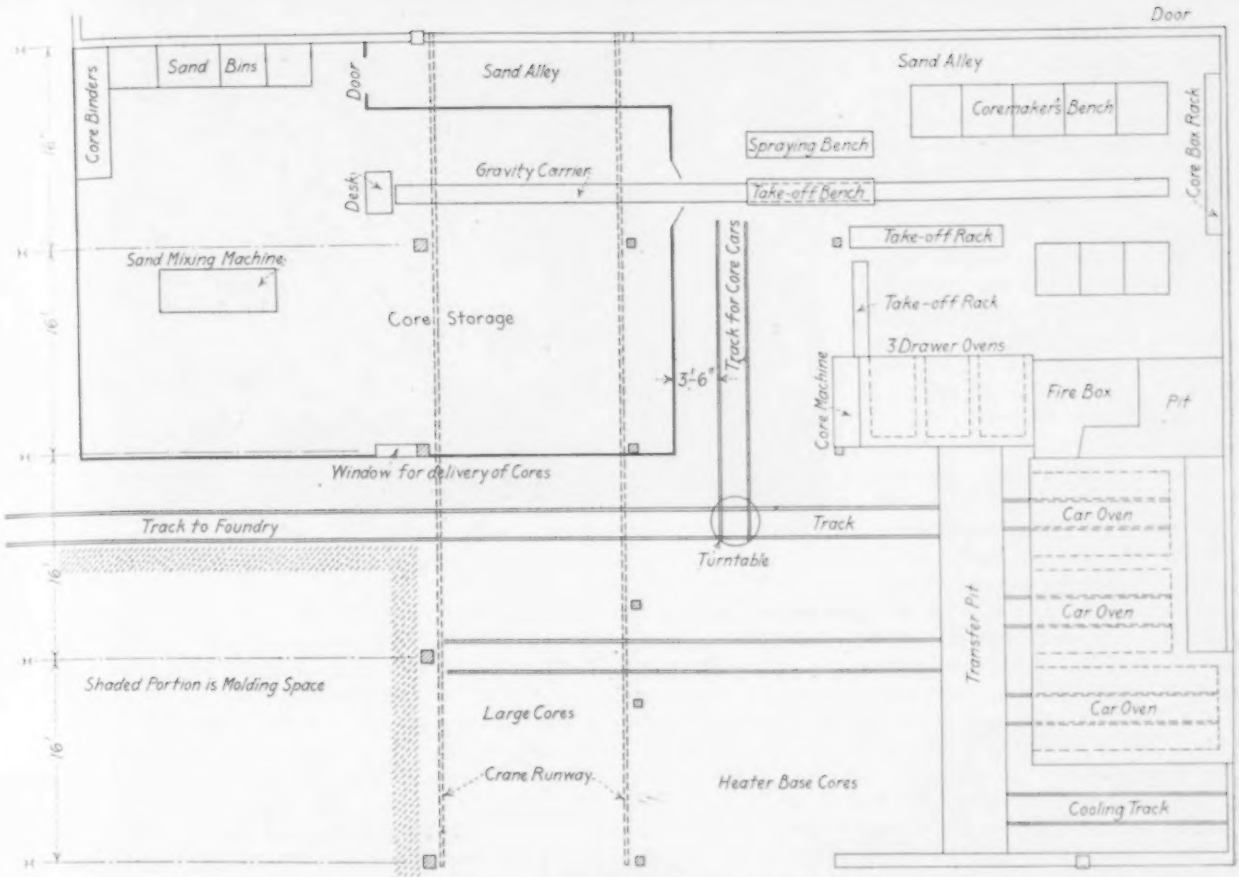


Fig. 3—The New Arrangement of Core Room

over the ovens, a monitor was constructed in the roof as shown in Fig. 4.

The fire box end of the ovens is shown in Fig. 5. The forced draft rigging consists of a motor shown at the right, which drives the exhaust fan on the left. This exhaust fan has an extra pulley on the fan shaft so that it does duty both as a fan and as a jack shaft. On the extra pulley there is a belt to the blower fan which is located next the motor. The blower fan supplies air to the ash pit and to the tuyere system used in tempering the air in the flues leading to the ovens.

The ovens are also provided with a pyrometer system which consists of an electric couple in each oven connected to an indicating electric thermometer furnished by the Wilson-Maeulen Company, New York. In addition to this there is a recording mercury thermometer furnished by the Taylor Instruments Company, Rochester, N. Y. The recording thermometer is used as a check of the record kept by the oven tender. The introduction of these thermometers has made it possible for the oven man to determine when a car or drawer of cores should be removed without opening the oven for inspection. This is to avoid unnecessarily cooling off the ovens and is found to increase the output.

The cores required cover a wide variety of sizes and shapes. There are three principal classes: First, small or intricate cores made mostly of oil sand; second, large heater base cores made of oil sand; and third, engine frame cores made of black sand, using a black core compound. For the making of small or medium sized cores seven special benches were arranged as shown in Fig. 6. Two of the benches are located on the right of the conveyor in the center and do not show in this illustration. The workmen place their cores on the gravity carrier as fast as they are completed and it is the duty of the oven tender to see that the carrier is kept clear. Certain of the cores are passed directly to the drawer ovens which are located at the right of the portion of the room shown in Fig. 6. The remaining small cores are placed on a car on a spur

Fig. 5—Fire End of Core Ovens

track as shown on the plan, Fig. 3, and also in Fig. 7.

All of the core benches are arranged with the sand alley back of them so that the core sand is delivered to bins back of the benches. Two benches shown at the left of Fig. 6 have adjustable tops which can be arranged at different hights so that the top of the core box always comes slightly below the bottom of the sand bins, the sand being simply raked into the top of the core box. There are shelves provided at the top of the benches for the delivery of core plates and other supplies from the rear. This type of bench was developed jointly by F. A. Parkhurst, organizing engineer at the Aluminum Castings Company, and H. M. Lane, in connection with the systematizing of the core room work for the Aluminum Castings Company. The bench is arranged to provide a place for everything the core maker needs and to reduce his labor to a minimum.

Fig. 6—Core Making Benches and Gravity Carrier

Fig. 7 shows a car on the spur track which leads back to the gravity carrier, and also illustrates several points in regard to the planning of the room. At the extreme right of the illustration can be seen the end wall of the drawer ovens and against it a Wadsworth stock core machine. The cores made on this machine can be placed directly on the car behind the operator, or they can be passed through the rack seen beyond the core machine to the drawer ovens.

At the left of the illustration there is a set of shelves on which are arranged the core boxes that are waiting for the core makers in the department. In addition to this set of shelves there is a set of shelves at the back end of the room as shown in the back-ground of Fig. 6. These shelves are used for the storing of the core boxes which will be used by the core makers at that end of the room during any half-day period. At the end of the room in Fig. 6 may also be seen wire reels for the standard sizes of core wire kept in stock.

Four styles of core cars are in use in this core room, each having been designed for a specific class of work. Standing on the transfer car at the right of Fig. 1 there is a car intended for chunky work. In the center of Fig. 7 there is a car intended for small work. In addition to this car there is a special car for heater base cores, some of which are 11 ft. long and about 6 in. square. The cars shown at the left of Fig. 1 and in the center of Fig. 7 have adjustable arms for carrying the shelves, so that they can be arranged for any number of shelves that may be required.

All cores which one man can handle are made on the benches shown in Fig. 6. Larger cores are made under the crane shown in Fig. 8. The cores made in this department frequently weigh 1200 to 1500 lb. each, and they are set on the cars with the crane, sent to the oven for baking, and after they are baked the core cars are taken directly to the foundry where the cores are unloaded by the traveling crane in the main bay of the foundry.

If for any reason these large cores should have to stay in storage for a few days, the traveling crane shown in Fig. 8 is arranged to pass over a portion of the store room and a special department is fitted to receive this heavy class of work. When these cores are finally sent to the foundry the traveling crane loads them on a roller bearing car which runs on the track leading to the foundry.

All cores which do not go to the foundry immediately are stored in a stock room, a portion of which is shown in Fig. 9. The gravity carrier which runs through the core room ends just back of the stockkeeper's desk shown in Fig. 9. At the time the photograph shown in Fig. 6 was taken a lot of cores packed in boxes were being sent from the ovens to the stock room. Cars of baked cores coming from the cooling track can be delivered to the position shown in Fig. 7. Here the cores are unloaded, packed in boxes, and sent through into the stock room which is on the left, behind the core box racks.

When the foundry requires cores they are obtained from the stock room on special requisition. Each order for castings carries with it an order for the corresponding number of cores. If, however, the molder breaks cores, he has to get a special order from the foreman be-

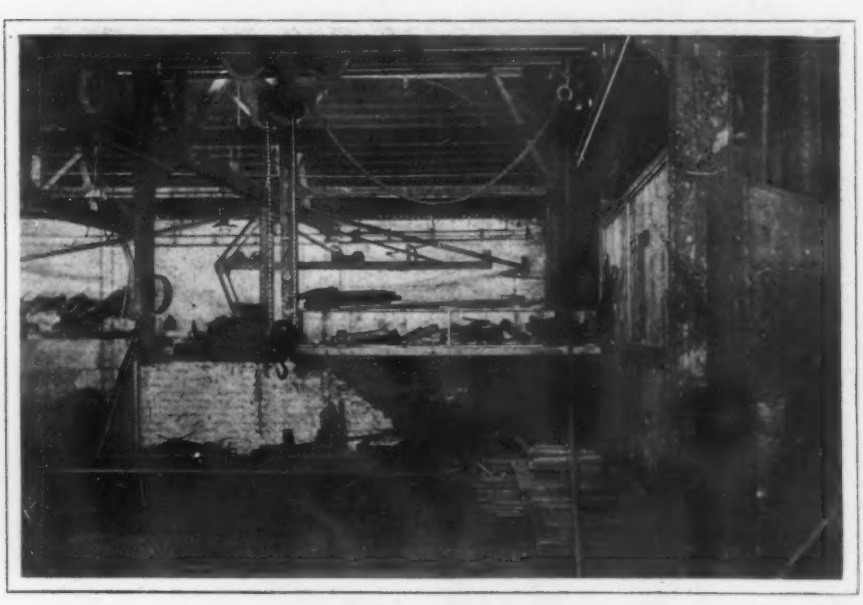


Fig. 8—Crane Floor for Making Heavy Cores

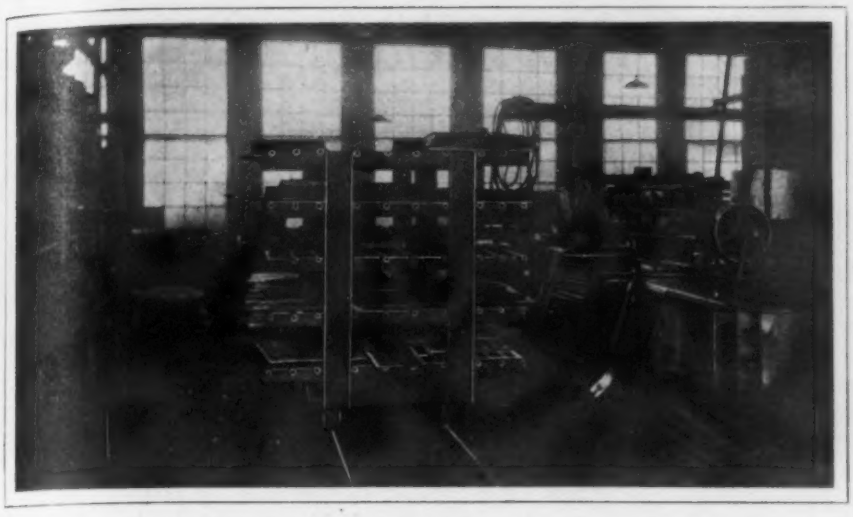


Fig. 7—Spur Track for Loading and Unloading Core Cars

fore he can obtain the additional cores necessary for the job. This gives a direct check on the breaking of cores in the foundry. The stock room count compared with the check kept on baked cores gives an account of the core breakage in the core room. Special orders have to be issued for the replacing of broken cores, whether the breakage may occur in the core room, core storage, or in the foundry. This system makes each man directly responsible for the cores in his care, and has resulted in almost entirely eliminating breakage.

At the right in Fig. 9 can be seen one end of the sand mixing machine which is located in one corner of the stock room. This arrangement was made necessary on account of the location of the sand bins and power facilities. The plans for the rearrangement of the core room were prepared by T. A. Leyshon, resident engineer at the American Blower Company, for the H. M. Lane Company, Detroit.

Progress in Sand Cleaning Tests

A dinner attended by a number of Detroit foundrymen was given lately at the Board of Commerce in that city. Those present included Henry M. Leland and Joseph J. Wilson, Cadillac Motor Car Company; C. H. Gifford, American Blower Company; Chas. E. Sorensen, Ford Motor Company; F. L. Bromley, Detroit Foundry Company; R. F. Flintermann, Michigan Steel Castings Company; J. G. Johnston, American Car & Foundry Company; G. B. Duffield, Detroit Lubricator Company; W. E. Burns, Michigan Malleable Iron Company; F. J. Haynes, Dodge Bros. Company; S. W. Utley, Detroit Steel Castings Company; Arthur T. Waterfall, representing the Board of Commerce, and H. M. Lane, H. M. Lane Company. The object of the meeting was to discuss the sand cleaning experiments which are under way at the laboratory of the last named company. These had been made necessary on account of the increased cost for the removal of old material from foundries in the Detroit district, and the experiments are the result of a co-operative movement of foundrymen and manufacturers of equipment. Several foundries outside of the Detroit district are also interested.

Mr. Lane reported that the entire expenditure necessary to carry on the tests will be about $7300, of which all but $2200 has been contributed or pledged. The original contributors to the fund had agreed to give $100 each. Those present voted that this be increased to $150 each, and a committee was appointed to secure at least ten more firms who would join in the movement. The plant is now complete and the tests are under way. The preliminary tests thus far run indicate that the material can be greatly improved and a large percentage saved for re-use.

Fig. 9—A Portion of the Core Storage Room

New Steel Works at Massillon, Ohio

A new steel plant will be erected in Massillon, Ohio, by the affiliated interests of the Massillon Rolling Mill Company, Canton Stamping & Enameling Company, American Stamping & Enameling Company, Bellaire, and Geiger-Jones Company, Canton. It will furnish sheet bars for the Massillon Rolling Mill Company, which will consume a large part of the output. There will be three 50-ton open-hearth furnaces, a 32-in. blooming mill and a 24-in. bar mill. High-grade sheet bars will be made to supply the demand of the rolling mill company which makes special high-grade sheets. The plant will adjoin that of the Massillon Rolling Mill Company, which has a 200-acre site favorably located. It will be operated by a separate company, the name of which has not yet been decided upon. Contracts will be placed as soon as detailed plans can be prepared, or within the next 60 days. It is probable that the plant will be electrically driven.

The Atlantic States Coal & Coke Company, it is announced, has decided to erect a large coal storage and coke manufacturing plant at Port Bolivar on Galveston Bay, which is across the harbor channel from Galveston, Texas. It is planned to load ships bringing coal from Atlantic ports with Texas iron ore for Eastern works on the return trips, thus cutting in half the cost of transporting the coal.

The Works of the Alton Steel Company

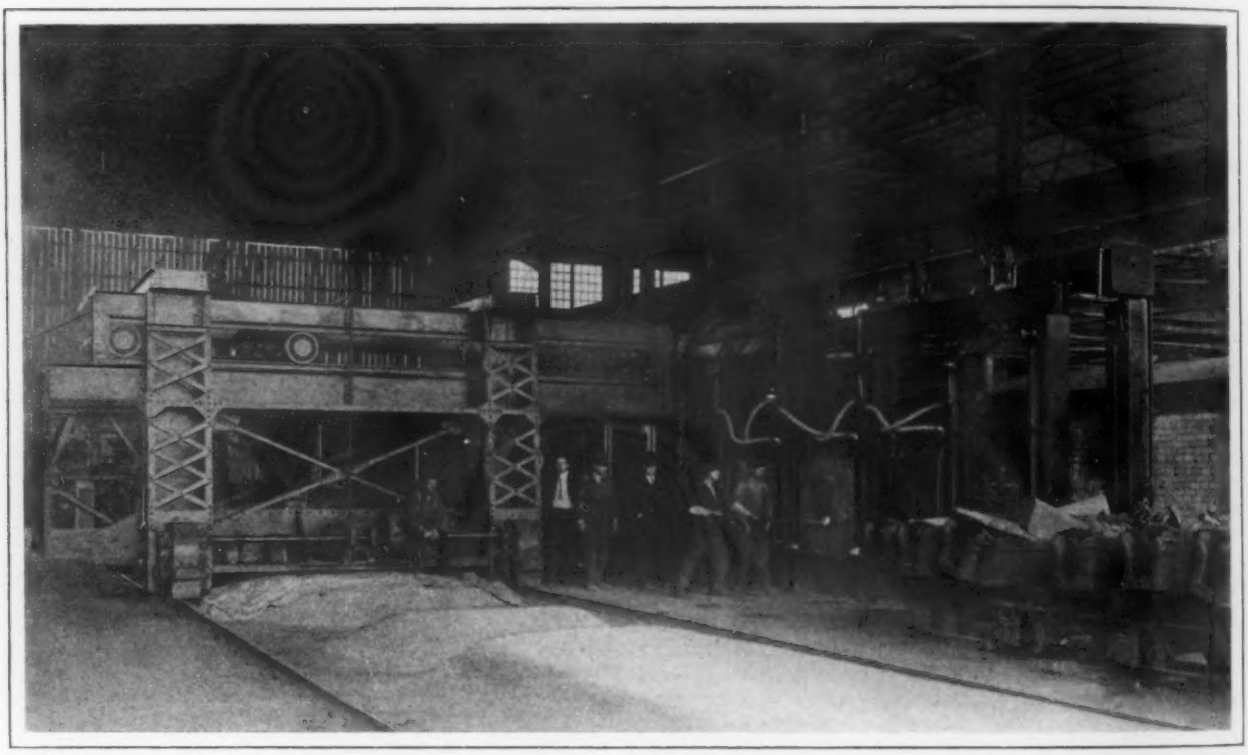
Cotton Ties, Hoops, Band, Billets and Strip Steel the Output—Interesting Equipment for Breaking Down Blooms

Taking advantage of what seems to be a natural distributing point for its particular products, the Alton Steel Company, organized by T. S. Clark in 1912, has recently completed its plant for the manufacture of cotton ties, hoops, bands up to $\frac{3}{8}$ x 4 in., billets up to 6 x $3\frac{1}{2}$ in., and strip steel. This is the only inland mill for cotton ties west of the Allegheny Mountains, and appears to be most favorably situated for marketing its output in the Mississippi Valley, both south and north as well as to the westward.

From the standpoint of the assembly of raw materials, the location of this new mill seems equally fortunate. It immediately adjoins the southern Illinois coal fields where usable grades of coal are obtainable for little more than switching charges. It is also within the St. Louis market for scrap and within the range of the Chicago market. For pig iron Southern sources are available at St. Louis rates, and for Northern iron Alton under ordinary circumstances is a highly competitive point between Chicago and Ohio irons. The company will manufacture both acid and basic open-hearth steel, the former for the products requiring more highly finished surfaces.

The plant is located on a tract of about 50 acres from which connection is had with the Chicago & Alton, the Big Four and the Illinois Terminal railroads. The property is close to the Mississippi River, so that the low level of the ground required a 12-ft. fill. The plant, a lay-out of which is here shown, comprises an open-hearth building in which there are at present two furnaces; a blooming mill building, housing a 32-in. blooming mill with ingot heating furnaces and gas producers, and also two 18-in. mills in tandem with run-out tables and drives; a 10-in. mill building; an 8-in. mill building and machine and blacksmith shops. Running on double turn, this mill will have an output of approximately 7500 tons per month.

The open-hearth building is of steel skeleton structure 126 ft. wide by 157 ft. 6 in. long. Owing to the likelihood of floods, it was not possible to take advantage of the natural lay of the ground in arranging the elevations of the open-hearth building, and the pouring floor is at the filled yard level and the charging floor 18 ft. higher. The foundations for the furnaces are of concrete carried on a slab 2 ft. thick, the total depth of foundation being over 15 ft. The pouring side of the open-hearth plant is spanned by a 50-ton Toledo Bridge & Crane Company's ladle crane, while for serving the charging floor a 15-ton scrap crane with a span of 65 ft. and of similar manufacture is installed. This crane is equipped with a Cutler-Hammer magnet with Electric Controller & Mfg. Company's control. The runway of this scrap crane is continued out from the charging floor on steel columns, which are continuations of the open-hearth building columns, inclosing a scrap yard 65 ft. wide and 200 ft. long. This scrap yard is traversed diagonally by two railroad spurs over which incoming scrap may be received. From the scrap yard the material may be handled in the charging boxes by magnet and crane directly to the charging floor, there to be fed into the furnaces with a Wellman-Seaver-Morgan high-type charging machine. The end of the open-hearth building overlooking the scrap yard has been left open. An open-hearth storehouse for repair materials adjoins the scrap



Charging Side of Open-Hearth Plant, Alton Steel Company

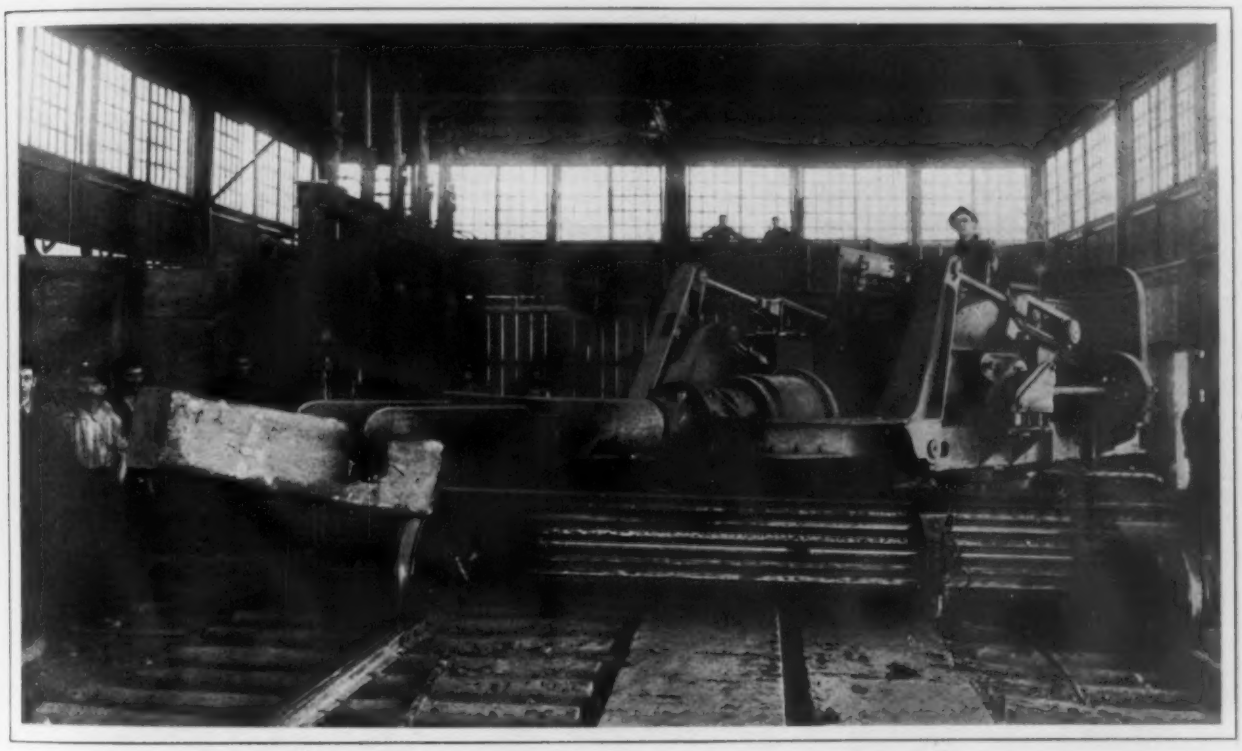
yard, and a method for handling these materials is thus conveniently afforded.

The furnaces themselves are of standard oil-burning design placed 67 ft. 6 in. between center lines. The length of the furnace pan is 27 ft. and the width 14 ft. 7 in. They have a rated capacity of 40 tons per heat, but in most instances have an actual capacity exceeding that amount. The first heat taken in the acid furnace was a melt of 90,000 lb. in 5 hr. 40 min. The furnaces are built with a 12-in. straight roof. Each furnace has eight cast-iron buck stays of U-section, and the stay is 12 in. deep, 11 in. wide, and the metal 2 in. thick. These stays are reinforced with 1-in. steel plate on the outside; the remainder of the furnace binding is of structural steel. The furnaces are equipped with Knox water-cooled doors and Swindell valves. These are hand operated.

Bottle neck ingots are poured in closed molds. The standard ingot is 60 x 12½ x 14½ in. and weighs 2800 lb. The regenerator chambers of the open-hearth furnaces are 16 ft. long and are divided into two sections; one 6 ft. 8 in. wide and the other 10 ft. wide. Each open-hearth furnace has a 125-ft. steel self-supporting stack 5 ft. in diameter. The checker work in the regenerator chambers is arranged to afford 108 sq. ft. of heating surface per ton of metal melted. The charging boxes for the open-hearth plant were furnished by the Variety Iron Works, ingot molds by the Valley Mold & Foundry Company, and ingot cars by the Orenstein-Arthur Koppel Company. To provide a narrow-gauge track for these ingot cars a third rail is laid between the standard-gauge tracks which extend from the tapping side of the open-hearth plant to the yard scale and the stub where the ingots are stripped. This ingot stripper stub extends under a continuation of the crane runway on which is mounted the 15-ton 50-ft. span Toledo crane which serves the blooming mill. This crane is equipped with an ingot stripper of 50 tons capacity, as indicated in the general plan.

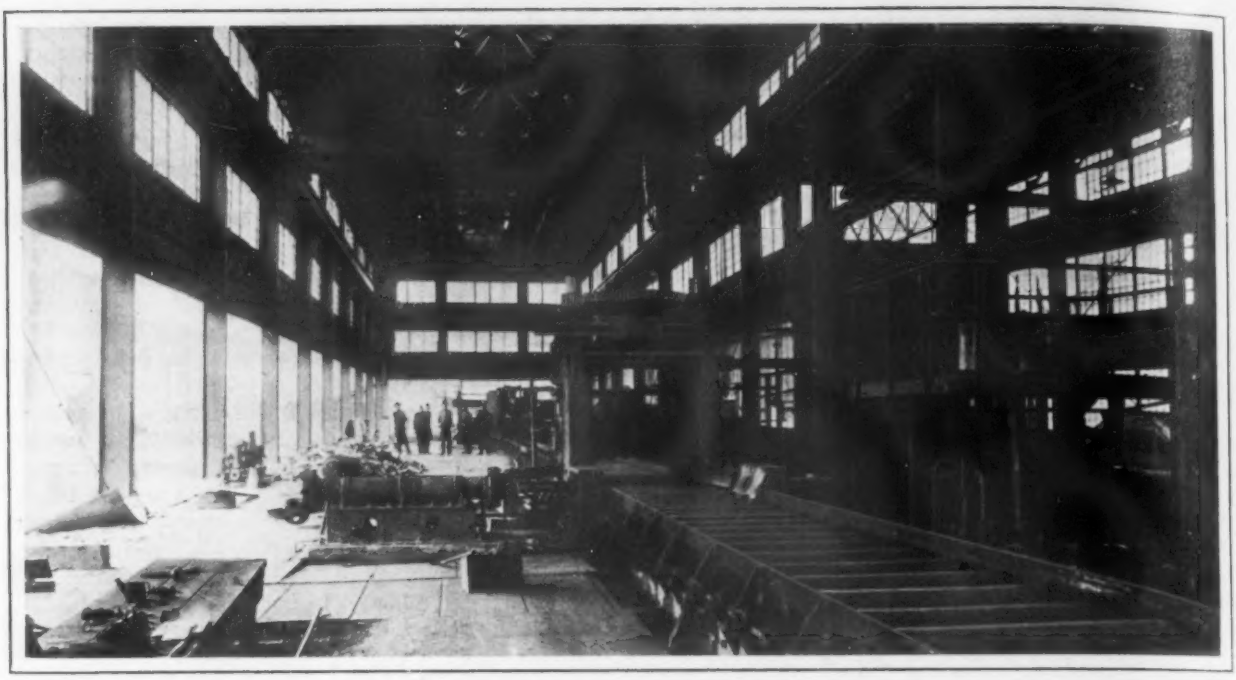
The arrangement of equipment for reheating the ingots and delivering them to the blooming mill for breaking down and the subsequent roughing and finishing passes in an 18-in. mill, from which the steel is delivered in billet size, are apparent from the plan. A 4000-lb. Wellman-Seaver-Morgan Company ingot charger, operating from a sub-floor trolley at right angles to the run of the mill, charges the stripped ingots into two Swindell horizontal heating furnaces which parallel the runway of the charger. These furnaces are located one on each side of the blooming mill approach table. They are 9 ft. deep by 25 ft. long inside, and are equipped with five doors, hydraulically operated. These furnaces are fired with producer gas generated in five 10-ft. Swindell hand poked producers. The gas is conducted to the furnaces through underground conduits. The heated billets are delivered to the blooming mill table by the ingot charger.

The blooming mill and drive have had an interesting history. They were designed in 1890 by J. P. Witherow, of New Castle, Pa., and were installed in the plant built for the unfortunate Watts Iron & Steel Syndicate, Ltd., which located at Middlesborough, Ky. That company succumbed to the pressure of hard times in 1893, practically before the mill was operated. The mill is a 32-in. two-high type, driven by a 36 x 48 in. twin reversing steam engine, which also drives the blooming mill tables. The manipulator screw downs and engine reverse for the blooming mill are operated by hydraulic power under a 400-lb. pressure system. The mill breaks down the ingot in 11 passes from 12½ x 14½ in. to 6 x 3½ in., the largest billet sizes being made direct on the mill. For the shearing of these large billets from the bloom a 6 x 9 in. United Engineering & Foundry Company's vertical hot billet shear is installed between the blooming mill and first 18-in. mill.



Ingot Charging Machine for Reheating Furnaces for Blooming Mill

For additional reductions and down to 1¾ in. square without reheating, the steel from the blooming mill is given six passes through two 18-in. three-high tandem mills built by the Wheeling Mold & Foundry Company, and placed 70 ft. between centers. These 18-in. mills are driven by an 800-hp. 2300-volt, three-phase, 25-cycle Westinghouse heavy-

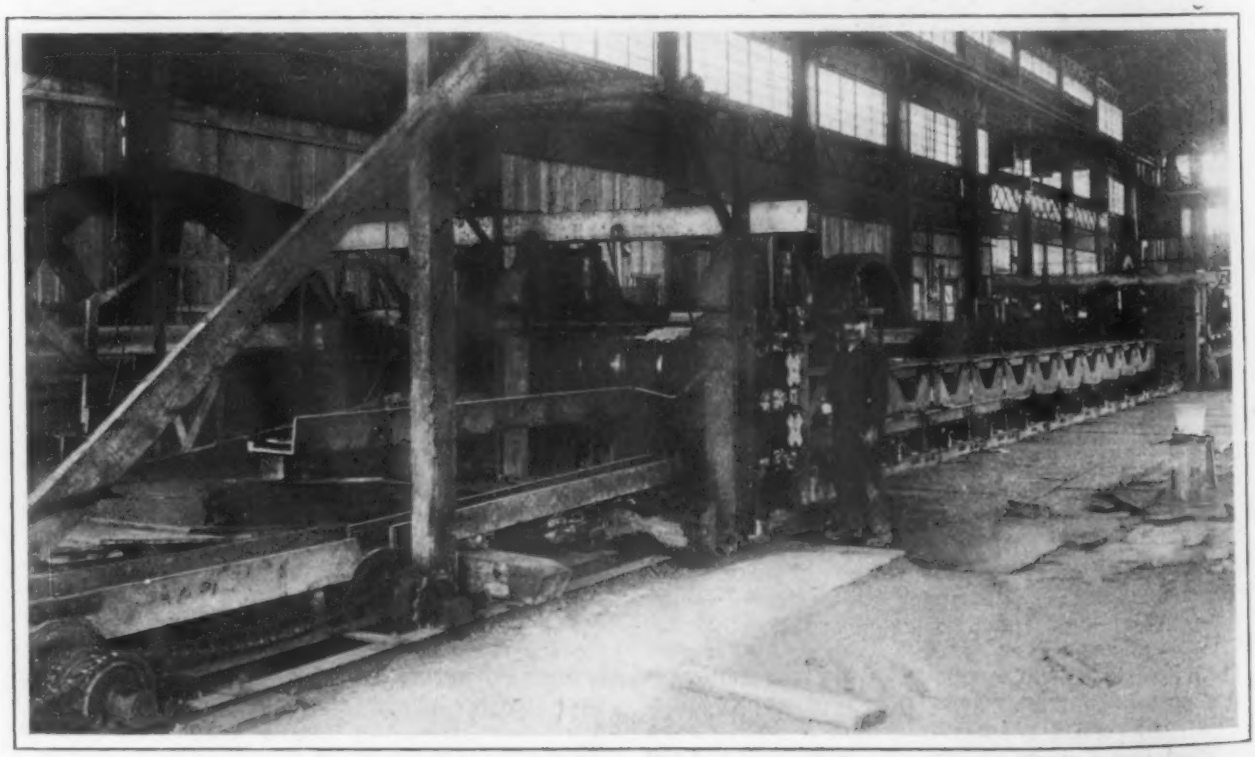


The 32-In. Blooming Mill and Drive

duty induction motor operating at 295 r.p.m. The drive from motor to mill, consisting of a Dodge rope drive from a 5-ft. sheave on the motor shaft to a sheave 15 ft. in diameter on each 18-in. mill, gives a mill speed of 90 r.p.m. The two-high tables between the 18-in. mills are United Engineering & Foundry Company's design. From the 18-in. mill the billet stock 1¾ in. square is run out to a No. 3 United Engineering & Foundry vertical shear to be sheared into 40-ft. lengths for subsequent rolling in the 10 and 8 in. mills, or if for sale in small billet form, to shorter lengths. From the shear tables the stock is delivered to the billet cooling beds. This shear delivery table and these cooling beds are located under the span of a 15-ton yard billet crane, the runway for which has a 50-ft. span extending 450 ft. at right angles to the several mills and serving as the connecting medium of transfer for steel in process of rolling. It also provides a temporary storage space for steel in that interim in the work.

The 10-in. and 8-in. mills are arranged in parallel units. The 10-in. mill building has an over-all length of 448 ft. and the 8-in. mill 407 ft. The reheating of stock for rolling on the 10-in. mill is done in a 30-ft. Morgan continuous furnace of standard type supplied with gas from two Morgan gas producers with George automatic feed. The heated billets are delivered directly from the furnace to a 12-in. four-stand Morgan continuous mill, which is driven from a 1200-hp. motor that also drives the roughing side of the 10-in. mill. The arrangement of this equipment is shown in the general plan. The 10-in. mill, which was furnished by the Lewis Foundry & Machine Company, is a roughing mill of four stands driven by the 1200-hp. motor mentioned and a one-stand bull head set driven by a 600-hp. motor.

Stock for the 8-in. mill is heated in a Swindell



The Tandem 3-High 18-In. Billet Mills with Two-High Tables Between

billet heating furnace, gas fuel for which is supplied from three Swindell producers. The 8-in. mill is of similar type to the 10-in., and consists of four roughing stands driven by a 700-hp. Westinghouse motor and a single stand bull head, driven by a 300-hp. Burke motor.

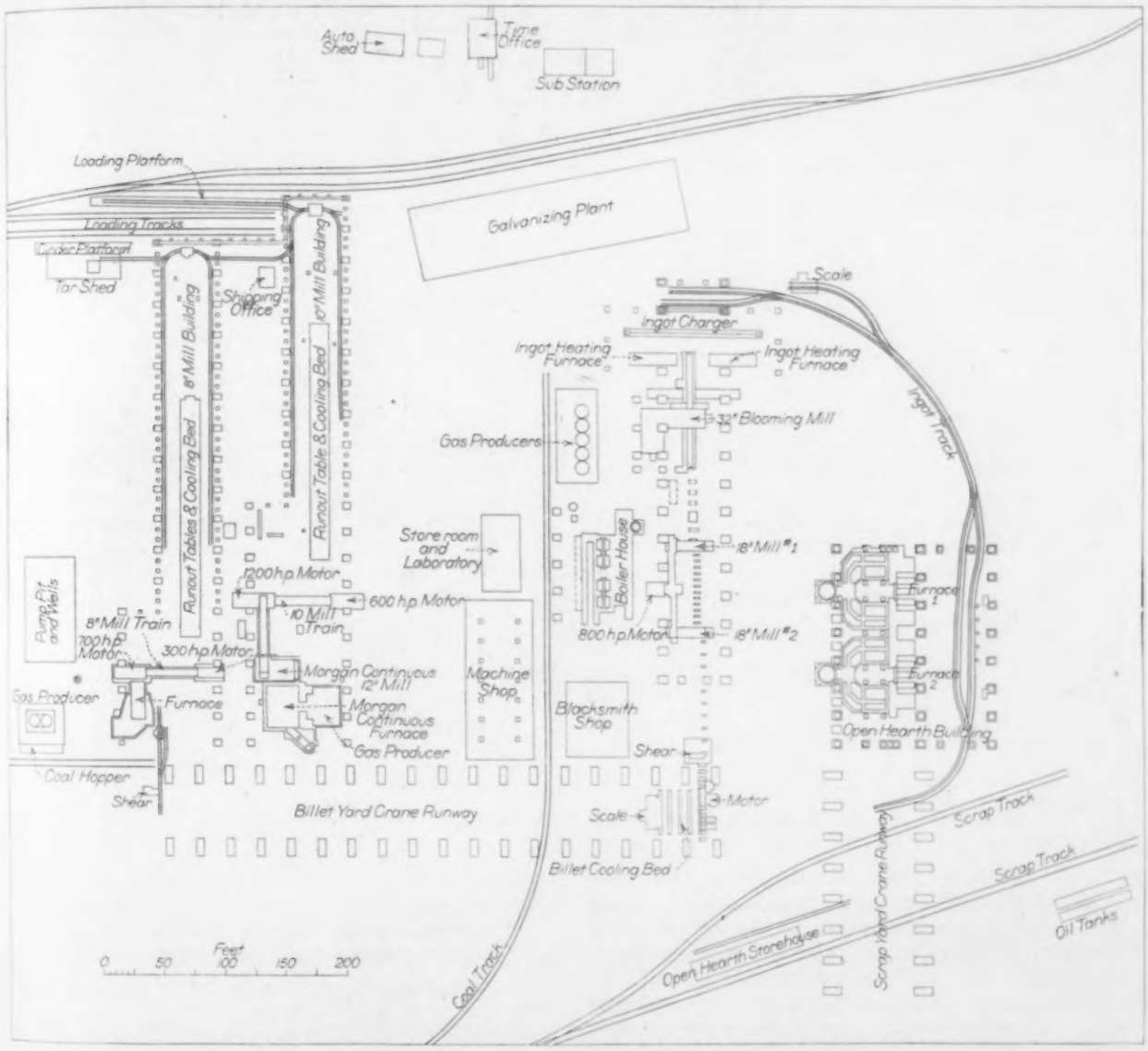
The motor speeds for the 8 and 10 in. mills are as follows:

For the 8-in. roughing stands, 365 r.p.m.
For the 8-in. bull head stand, 475 r.p.m.
For the 10-in. roughing stands, 292 r.p.m.
For the 10-in. bull head stand, 485 r.p.m.

The four continuous 12-in. roughing roll speeds are 45, 63, 93 and 125 ft. per min.

the principal drives of the mill are operated. All the smaller drives are on a 440-volt, three-phase, 25-cycle circuit. For direct current there is installed in the substation a Westinghouse motor-generator set with self-synchronizing motor of 250-hp. generating current at 250 volts. The water supply is secured from six 10-in. deep wells hooked up with a pumping station consisting of a two-stage 800-gal. Alberger centrifugal pump with a 50-hp. Westinghouse motor direct connected.

The auxiliary departments of the mill include a blacksmith shop, 50 x 50 ft. in size, in which an 800-lb. Erie Foundry Company's steam hammer is placed for the heavy work, and a machine shop 155



General Plan of Works of Alton Steel Company, Alton, Ill.

United Engineering & Foundry lever shears are installed in both mills. The arrangement of the 30-in. gauge track in both 8 and 10-in. mills in conjunction with the scales and loading platform is indicated in the general plan. Hoop coilers are placed in the delivery end of both mills.

The entire plant with the exception of the blooming mill is electrically driven on power supplied from the Mississippi River Power Company's plant at Keokuk. This power is delivered on a 110,000-volt line from Keokuk to Meppan and from Meppan to Alton at 60,000 volts. At Alton the voltage is brought down to 13,000 volts for transmission to the steel plant substation. Here there are installed two General Electric 1500-kw. 13,000-2300-volt stepdown transformers. At the latter voltage

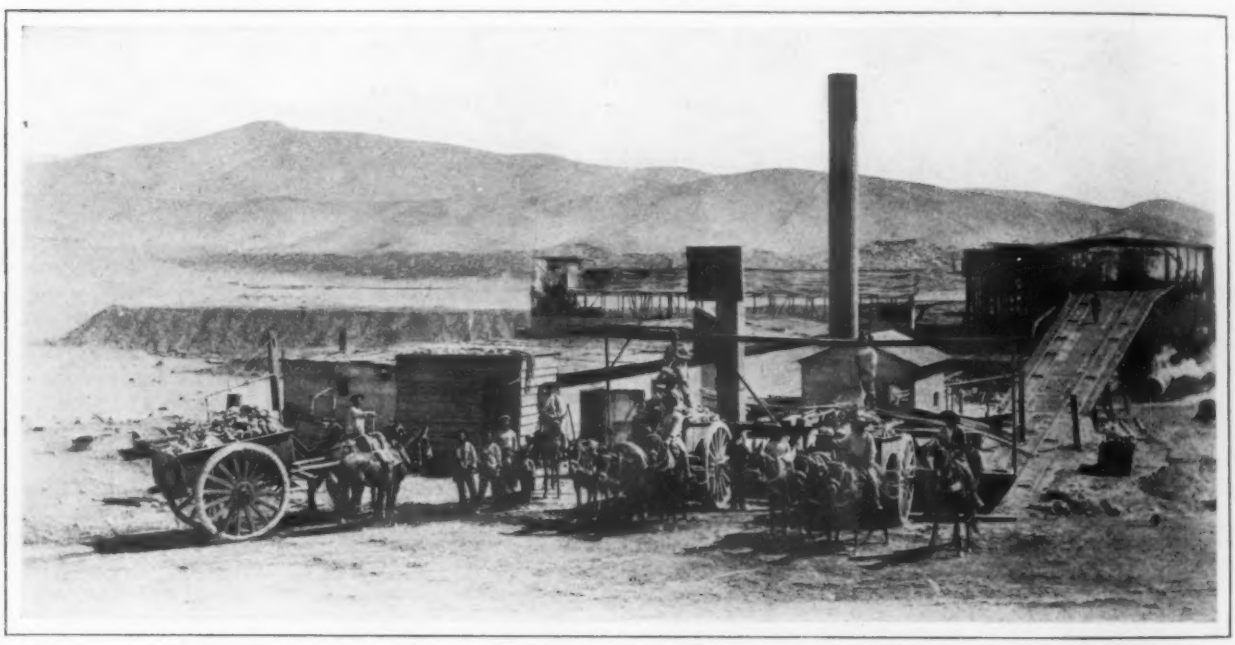
x 160 ft. in size. In addition to this shop there are installed adjacent to the blooming mill two 18-in. and one 34-in. roll lathes, and a Landis grinding machine. The steam plant for the blooming-mill engine includes three 410-hp. Rust boilers, making steam at 160 lb. and equipped with Illinois stokers for burning Illinois bituminous coal. The boilers have a Buffalo Forge induced draft, using a 120-in. conoidal fan discharging into a stack 78 in. in diameter and 80 ft. high. For the handling of coal from the cars to the coal bunkers a Link-Belt yard crane is used. The boiler auxiliaries include an 800-hp. Cochrane open-type feed-water heater and a 10 x 6 x 10 in. Buffalo steam feed-water pump. The boilers are equipped with Williams' non-return valves.

Chile as a Buyer of Our Steel Products

Railroads Must Be Re-Equipped and Outlays Are Bound to Be Large—the Nitrate Industry Calls for More Efficient Production

BY CHARLES M. PEPPER

SANTIAGO, CHILE, January 10, 1914.—Chile has such varied resources that in dealing with the market here for American products, and especially iron and steel products, temporary conditions may be ignored. The country will keep on building railroads and improving the ports, making sanitary betterments and giving towns and cities sewerage, whatever may be the immediate outlook. Chile is so fully embarked on this policy that the only question is how to keep these projects within the limits of existing financial resources. The powerful family groups which constitute the ruling classes do not look with favor on fresh taxation. When they remedy the present disordered currency and give Chile a stable financial system much of their trouble will disappear. Meanwhile, the private companies which have bought iron and copper mines will continue to build railroads and call for machinery and material, though some of them in their preliminary purchases have taken advantage of the material which the Panama Canal Commission has been selling at a bargain.



In the Chilean Nitrate Fields. Bringing the Dynamited Material to the Crusher

IRON AND STEEL BUYING IMPERATIVE

In addition to Chile's normal demand for iron and steel products there is an economic situation which will keep the country in the market. The railroads have to be supplied with a large quantity of new rails and rolling stock if their efficiency is not to be entirely lost. This is in substance the statement of the railroad department of the government. Then, the nitrate establishments must modernize their methods and a huge quantity of material must go to the scrap heap if that industry is to yield a satisfactory return on the capital invested. This is the assertion of the men who represent enormous English and German investments in the nitrates.

The necessity of material for the railroads has given rise to an interesting controversy. It was referred to by the Minister of Railways in defending his department in Congress. Everybody agrees that they are in bad shape, but no one realized how bad until the minister presented a tabulation showing the number of locomotives which were of no use. He gave much other information the pith of which was that some sections of the lines practically would have to be rebuilt and that all of the sections must have new rolling stock. In a word, the Railway Department admitted the justice of the complaints against the operation of the railroads and said the cause was the failure of Congress to provide funds for maintenance and repair, though the urgency of the situation repeatedly had been laid before it.

WHY THE RAILROADS ARE RUN DOWN

Government ownership, the minister contended, was in no way responsible for the present deplorable condition of the state lines and for the continuous and continuing annual deficits, because in the earlier period they had served the purposes of the country and at the same time had shown a surplus. He presented tables running back more than half a century to prove his case.

The opposition retorted that if the railroads were run half a century ago with profit to the state and means found out of their revenues to keep them in proper repair for efficient service, it was because they were properly managed and operated and if that had been done during the last few years there would be no need of constantly coming to Congress with a demand for appropriations to meet the deficiencies.

The debate in the Congress and the controversy in the newspapers throw a side light on the government ownership and operation of railroads. The

Chilean state system, previous to the last links in the construction of the Longitudinal Line, comprised approximately 2000 miles. The main trunk serves the fertile central valley with its most valuable freight and passenger traffic. The line between Valparaiso and Santiago also has valuable traffic. The Trans-Andean international line across the Cordilleras to Argentina required heavy government subventions and in itself might not yield much revenue, although the passenger traffic, which is largely international, is rapidly growing. This section, however, is not operated as a state railroad. Some sections of the Longitudinal which was built principally as a strategic line never will pay, but these are mostly the new sections and are in no way responsible for the deficits in past years.

THE RAILROAD DEFICIT

Notwithstanding the profitable traffic existing for the greater part of the state lines, the deficit in 1912 was a fraction under $10,000,000, although the gross receipts had gone up $11,000,000 over the previous year. The operating expenses increased by more than $8,000,000 and consequently the deficit was to be encountered as in former years.

That it costs more to operate the railroads than would be the case with private corporations is admitted, for if not managed exactly as a part of a political machine politics nevertheless enters into it and the costs of operation are greater. There are 10,000 employees.

The cabinet officer who was defending the government administration of the lines and laying the blame on the Congress for the bad condition into which they had fallen did not seem to see in this an argument against state ownership, although private ownership would not be subjected to the uncertainties of a political body for keeping a system of railroads in a position to take care of profitable traffic.

NEW EQUIPMENT INEVITABLE

The question of government ownership, however, is Chile's business; and since it has prevailed from the beginning of railroad construction, doubtless it will continue. Chileans admit that it has drawbacks, but they say that the abuses of private corporations, which have required remedial legislation in the United States and other countries are avoided. Briefly, they say that government ownership presents fewer problems than government regulation.

The soundness of this view does not need analysis for those who are interested in Chile as a market. What is important to them is that in spite of the controversy as to the responsibility for the present bad state of the railroads, means will be found to purchase the material to put them in better condition either through a loan or out of the existing revenues. While the completion of the Longitudinal Line and the opening to traffic of the Arica-La Paz line into Bolivia are taken by many to mean that there will be no further construction by the government for a period of years, this assumption is not warranted by Chile's railroad policy in the past. The expenditures on railroad construction in 1912 exceeded $19,000,000. For the past year the amount is not so large, and for 1914 it will be smaller, but it will not be reduced to a cipher. When the financial depression is ended there will be strong pressure to build extensions and new lines to the various mining districts which are poorly off for transportation and which would supply plenty of freight. All these circumstances combine to make it certain that Chile will be in the market for railroad material right along.

The Ox Cart Is Not an Uncommon Means of Transport in Santiago Streets

ELECTRIFICATION NOT IMMEDIATE

The electrification of the line between Valparaiso and Santiago, a distance of 125 miles, will be done some day, but hardly in the immediate future. The government commission, which visited Europe and the United States, made detailed studies and since there is abundance of water power the project is entirely feasible. But the Chilean Congress does not seem to be in a hurry to authorize the change by providing funds with which to begin the work. Whenever it is undertaken European companies are likely to obtain the contracts. The electrical companies in the United States, either through indifference or through "a gentlemen's understanding," have not taken much interest in the prospect.

PROBLEM OF THE NITRATE INDUSTRY

The improvement of the nitrate industry presents an economic problem for both the govern-

ment and the private companies, entirely different from that of reconstructing and maintaining the railroads; but in this case the bulk of the purchases of material must be made by the companies themselves. The government is only concerned directly with the properties it has had to take over from one or two big companies which were unable to comply with the conditions under which they acquired the nitrate lands; but indirectly it has a deep interest in the continued prosperity of the nitrate industry because so large a portion of the national revenues come from the export tax on the nitrates.

The processes by which the nitrate of soda, or saltpeter, which is the common name of this fertilizer, is "mined" and turned into the commercial product which is exported, are so simple that heretofore it has been assumed that the crude methods which obtained would never have to be changed. The conglomeration which contains the saltpeter has also common salt, clay and gravel and sulphate of soda. The different layers above and below the *caliche*, which is the real fertilizer, easily lend themselves to the explosives that detach it from them in masses of débris. Then it is transferred to the *oficinas*, which include crushers, boiling tanks and settling vats. After the *caliche* is crushed and run into the boiling tanks the nitrate of soda is precipitated by itself as the water cools and the dry product is put into bags and is ready for shipment.

This process apparently is so simple that some of those who first engaged in the industry and drew vast sums from it were disposed to criticise their newer associates who established elaborate chemical laboratories. But it is now recognized that improvement can be made in almost every stage of the industry from the dynamiting of the *caliche* and its transportation to the boiling vats until as commercial fertilizer it is loaded on the vessels. All this means fresh purchases of material.

NEW ECONOMIES MUST BE FOUND

The present situation is that the more progressive men in the nitrate industry recognize that greater economic efficiency must be shown in preparing the nitrates for the world's markets, whether to meet competition from chemical fertilizers or to anticipate the greater productiveness of other fertilizers and the diminishing richness of the saltpeter deposits. For years the *caliche* of high quality was so abundant and so easily obtained that wastefulness was accepted as a mere incident. This condition no longer prevails.

It costs more to supply the commercial nitrates than formerly because the best part of the Tarapaca deposits have been worked. Moreover, while a few years ago fresh discoveries were made in the Antofagasta district and the official announcement was promulgated that these deposits were sufficient to meet the world's demand for centuries, it is a very general impression that these fields are far from equal to those of Tarapaca in quality, and therefore in commercial utility and as a source of national wealth they cannot fully compensate for the gradual exhaustion of the Tarapaca deposits. But for an indefinite period they will keep Chile from becoming a poor country if they are exploited by modern economic methods.

NITRATE EXPORTS WILL BE LARGE

The manner of marketing the nitrates responds to modern business methods. The nitrate trust might not meet the approval of President Wilson or ex-President Roosevelt, yet it has the support of the Chilean government. It goes by another name, that of the Nitrate Association and the Nitrate Propaganda. The Propaganda spends large sums each year in advertising the nitrates all over the world and the government contributes its quota to this fund. The producers study the quantity which may profitably be absorbed in a given period and after agreeing on the total of production apportion the quantity to which each *oficina* is entitled.

The government exercises a moderating influence. Since so large a part of the national revenues are dependent on the export tax on this commodity it is interested in a large production which will fetch a moderate price rather than in a limited production at high prices. At the same time it has a vital interest in preventing overproduction, for that would react and in the end would either decrease the exports or make it necessary to reduce the export tax below the limit which is essential for the state revenues. The exportation this year is likely to be approximately 2,500,000 tons.

These observations about some of the basic conditions of Chile as a market have occurred to me while in this beautiful capital because the questions of the state railroads and the nitrate industry have been occupying the attention of the Congress. In concluding them, I repeat my conviction that in spite of political uncertainties and of demoralized finances the country's natural resources are sufficient to tide her over temporary crises and she will continue to be one of the best customers in South America for iron and steel products. Her foreign purchases are likely to go above rather than fall below $120,000,000 annually.

Controlling Automatic Sprinkler Valves

A method of controlling the closing and opening of valves in connection with the automatic sprinkler system in factories, which method has been indorsed and recommended by the Factory Mutual Insurance Companies, was described in a paper presented at the recent annual meeting of the American Society of Mechanical Engineers, by Fred J. Miller, factory manager, Union Typewriter Company. The fact is emphasized that the thing most needed in connection with automatic sprinklers is to be sure that when a fire starts the valves carrying water to them shall be open.

The method described, which has been adopted and tested in a group of typewriter factories employing over 5000 people, makes use of a system of colored tags. All the sprinkler valves are numbered and tags are attached prohibiting the closing of the valve without a signed permit to do so, except in case of emergency. In the office of the factory is a board with a set of hooks numbered to correspond with the valves. When a valve is closed in an emergency, the tag which has the reason for closing the valve, the date when it was done and the name of the person closing it indorsed on it, is taken to the office and hung on the hook numbered to correspond with the number of the closed valve and a red card placed over it. These tags attract the notice of the person having the board in charge. As soon as he sees this, a portion of the red card is detached and is fastened to the closed valve, unless it has been previously reopened. When permission can be obtained to close the valve, the white card is left on it, the red one being divided, a portion remaining on the board in the office, while the other part is attached to the valve, the same as if it were a case of emergency closing.

The annual meeting of the Hamilton-Otto Coke Company was held in Cincinnati January 22. The directors of the company were all re-elected, as follows: E. M. Peters, J. C. Thoms, F. L. Perin, F. L. Garrison, H. L. Brunneman, Robert Ramsey and W. E. Hutton. E. M. Peters is president and J. C. Thoms vice-president.

PANAMA EXPOSITION EXHIBITS

Arrangements and Charges for Transporting and Erecting Machinery and for Power

BY WALDEMAR H. F. N. DE BILLE

It is perhaps not generally known that the Panama-Pacific International Exposition will not charge exhibitors for space, and that any manufacturer may have as much space as he requires to display his products properly, providing he makes application before the capacity of the building in which his product must be exhibited is fully allotted.

SHIPPING AND ERECTING ARRANGEMENTS

To facilitate the transportation, especially of machinery exhibits, all products in less than carload lots may be sent to one of the three central branch stations at New York, Chicago and St. Louis consigned to a representative of the exposition. This representative will assemble enough exhibits together to fill a car, and the consequent reduction in rates, sometimes 50 per cent., will be afforded the various manufacturers. The actual cost of handling the exhibit at the sub-station will be charged, and will in no case amount to more than 10 or 15 cents per 100 lb. Exhibits from the eastern territory may be consigned to the New York agent and will be forwarded to the exposition through the canal via the water route, the rate being less than one-half that charged by the railroads on exposition exhibits.

All of the roads, however, have agreed to return the exhibits from the exposition at its close to the point of origin free of charge. Carload lots and less than carload lots, if desired, may be consigned to the president of the exposition at San Francisco, and these cars will be shunted off on the exposition's own standard-gauge railroad, which covers every portion of the grounds.

Each exhibit must bear a standard label supplied by the exposition, on which the building, department, block and number of space is plainly marked and upon its arrival at the exposition grounds it will be unloaded on the space which it is to occupy. A charge of 15 cents per 100 lb. is to be made for this service. As much of the machinery will require cranes to place it in position, two 30-ton cranes have been provided for the central bay or nave and 20-ton cranes for each of the other four bays. These are electrically driven overhead traveling cranes. The entire floor of the building is designed for a load of 200 lb. per square foot and an average of over 750 lb. per square foot on the ground below. The north one-half is filled ground, while the south one-half is excavated. There is no space between the floor and the ground.

The exposition is anxious to have a part of each exhibit in motion, not only showing the commercial and efficiency features but arranged to be instructive from an educational viewpoint. The directors are co-operating with the exhibitors so that they may obtain the material or raw article needed to show actual operating conditions, and are also making arrangements for the disposition of the article after its manufacture.

POWER PROVISIONS

Saturated steam at a pressure of approximately 160 lb. per square inch will be supplied. Headers and mains for live steam, exhaust steam, drips and drains, will be installed by the exposition. The steam will be furnished at actual cost, the rates to be fixed as soon as the various elements of cost have been determined.

Compressed air service, which must be arranged for in advance, at 80 lb. pressure will be provided, and a monthly charge made of $4 per horse-power of maximum demand of installation, and in addition 15 cents per 1000 cu. ft. of air consumed. One horse-power will be considered equivalent to 5.5 cu. ft. of free air used per minute.

The rates for gas will be as follows: $1 per 1000 cu. ft. for consumption in each month up to and including 50,000 cu. ft.; 80 cents per 1000 cu. ft. for the excess consumption in each month over 50,000 cu. ft. The minimum bill per month will be as follows: For installations having a ¾-in. meter, $2.50; 1-in. meter, $5; 1¼-in. meter, $7.50; 1½-in. meter, $10; 2-in. meter, $15.

Arrangements have been made whereby exhibitors may be supplied with all the electricity needed for power and will be required to pay only for the amount of energy used at the rate of 3 cents per kilowatt-hour. The lighting will be served from 60-cycle 3-phase 115-volt mains.

To lessen the expense to exhibitors several may combine and employ one attendant for the several exhibits. All exhibits must be in place before February 1, 1915. This rule has been made by the directors in order that the jarring note which has characterized expositions in the past of unfinished structures and incomplete exhibits may be lacking at the Panama-Pacific International Exposition.

The Carnegie Pocket Companion

The Carnegie Pocket Companion for engineers, architects and builders, published by the Carnegie Steel Company, Pittsburgh, Pa., has become very well known among users of structural steel. The sixteenth edition has just been issued. It represents fully the present status and the most approved methods in the art of steel construction.

The first edition of this book, issued in 1876 in connection with the Centennial Exposition at Philadelphia, was gotten out by Carnegie Brothers & Co., then proprietors of the Union Iron Mills at Pittsburgh, now one of the units of the present organization and the first of the mills rolling structural shapes. It dealt exclusively with iron. The last previous edition was issued in 1903, or, roughly, 10 years ago, and represented the status of the art at that date. It had a very large distribution, about 100,000 copies, and was generally found in the offices of engineers and architects. This book contained profiles of practically all the shapes then manufactured by that company.

In the 10 years which have elapsed the company has turned its attention to the manufacture of a diversified line of products, and it is no longer practicable to include in one publication all of the various shapes now made. In the present publication, therefore, only those rolled shapes are illustrated which are deemed most suitable for bridge, building, car and ship construction, and the tables given are intended for users of materials entering into such construction only. The book has been re-written from beginning to end, and users of the fifteenth edition, 1903, will note many changes. Among these are the inclusion of the American Society for Testing Materials' standard specifications for structural and other steels and the American Bridge Company's specifications for workmanship; the addition of tables and data on concrete reinforcing bars; data on floor construction, which covers terra cotta arches as well as reinforced concrete; especially complete tables covering weights and measures, which include convenient metric conversion tables on a new basis. The present publication is printed on a thin, opaque paper of a carefully selected tint, and reflects a great deal of credit from a typographical standpoint. Copies may be had by draftsmen, engineers and others at $1 per copy on application through any of the offices of the company.

Shop Efficiency as Affected by Drawings

Examples of Helpful Designations Made by the Drafting Room for the Steel Fabrication and the Machine Shop

BY EDW. J. KNAPP

As I have mentioned in former papers, there are many ways by which the drawing room can co-operate with the shop to the common end of cutting the cost of production, thereby increasing the efficiency. This co-operation simply amounts to an exchange of ideas, but the trouble lies in the fact that in many cases the drawing room and shop do not get close enough to do the exchanging. Another fault along the same line is the spirit with which one party will approach the other, or one party will be received by the other. If, for example, the shop finds what it thinks is a discrepancy in the drawing, and in taking it up with the chief draftsman uses a manner suggestive of lack of knowledge on the part of the drawing room, or implies that the drawing room does not know what it is doing, the advice or suggestions of the shop are liable to meet with aversion rather than co-operation. Possibly there is a cause for doing or designing the work in the particular way in which it has been done.

It is the spirit which one might describe as the "I-know-it-all manner" that tends to alienate the designing and producing ends of a factory, thereby killing all chances of co-operation. This condition has been known to exist elsewhere, between superintendent and foremen, between foremen and their men, among department heads. Anywhere it may exist it does not help to increase production or lower the cost.

We all admit that co-operation bringing about an exchange of ideas is an ideal condition. Efficiency men are continually looking for ways and means with which they can promote this condition. We have the suggestion box, the factory jury, all to develop co-operation and to bring out new ideas as well as exchange old ones. Therefore, why does it not pay for the drafting room and the shop to get together? The fault lies equally with both. Sometimes the shop is backward about approaching the drafting department or neglects to do it through forgetfulness. On the other hand, possibly the drawing room has discouraged the shop by not giving it the proper consideration. Therefore to force a better co-operation the men in the drawing room should be offered every encouragement to go into the shop, ask questions and watch the work as it progresses, at all times noting where they can improve their design to fit the shop conditions better; in other words, become more practical. This method offers a very good chance to the college men and the former shop man to keep abreast with new shop methods.

Joseph R. Poe read a paper before the Cleveland Engineering Society on "Practical Design of Steel Structures," in which he set forth the importance of co-operation, and explained the value of a knowledge of shop conditions to the draftsman. Following are a few examples pertaining to shop conditions, showing how a detail drawing can be made to save time in the shop. One reason for this reference is that the structural shop usually draws up all bevels with a square and rule, while the practice in the machine shop is to protract the bevel from the machine or surface table.

CONTINUOUS DIMENSIONS

Methods of dimensioning structural details have a great deal to do with the shop efficiency. In the shop the men labor under conditions very unfavorable to clear and accurate calculating. They have the continuous noise in their ears all the time. They are interrupted in their work frequently. All of which helps to cause mistakes and inaccuracy. Therefore, the plainer the dimensions on the drawing, the less the chance of error; but to get away from the calculating, adding and subtracting, the draftsman must get into close connection with the shop and learn how the shop men use the dimensions.

The layer out, or template maker, in laying out a structural shape, naturally starts at the end. He puts on his gauge line, then fastens a tape line at the end, if the piece is long, and marks off the spacing as the drawing designates. As the spacing is usually given, it is necessary for him to add the dimensions for each space as he comes to it, to the prior one or sums of successive spaces. The sum always designates the next hole or connection. This forces the workman to be summing these figures in his head, or by a slower method, adding them on paper. In case he does it in his head, there is always the chance of his making a mistake or forgetting the former sum. In either case he has to start all over again. Many times it is not the workman's fault that he has to go over the work a second time. Outside forces play an important part in it. Interruption and noise often distract his attention.

But, even though the workman does not have to go over this work twice, it is nevertheless done three to four times by different men in the shop. The man who checks the template or the iron before it is punched has to go over the same work. The fitter or assembler will have to do a certain amount of it, and last the inspector. Starting in the beginning, the draftsman must have had to do this work in order to enable him to know that his detail dimensions checked with the over-all dimensions. The point overlooked is the fact that the draftsman does not put his computations on the drawing, so that the shop men can use them without duplicating the draftsman's work. There is no doubt that the method of checking, or laying out each hole or connection from one common point, the end, is better than depending on the correct location of some other less common or nearer point, which will be done in preference to going over and summing up all the necessary dimensions.

NECESSARY DIMENSIONS

Many hours can be lost by machine hands through being forced to figure different dimensions in order to learn how much to machine the work to fit, that is, to add and subtract other figures in a round about way to arrive at the dimension wanted. Apprentices and handy men, who are not thoroughly conversant with detail drawing, are afraid to depend on themselves for the result, in case they do know how to go about it. Therefore they take other men's time by asking them. In case they do

not know how to arrive at the correct result, they have to wait and see the foreman. In either case time is lost by men and machines.

This is another instance where the draftsman can be more practical by studying the shop conditions. It is as important for the draftsman to know what dimensions to give the shop as it is to know the manner in which to give them. Some drawings hit all around a point and seem to give plenty of dimensions, but when it comes to the part to be machined, the workman has to get out his pencil and figure back and forth to arrive at the dimension he wants.

The engineering department might say: It is an easy matter for the shop to figure these dimensions. But that is not the point. The object of the drawing is to convey to the shop what the draftsman wants. Therefore, if the drawing is in such shape that a workman has to figure his dimensions, the drawing is not fulfilling its purpose. Another point is that the shop man is intended to do the actual work and is paid in that capacity, therefore if he has to spend time dimensioning the drawing, his time is taken from the work, thereby accomplishing less in a day.

Fig. 2 gives a clear idea of a case where an important dimension is omitted. In machining the casting, the machinist must know the distance from point *D* to point *C*, as both of these points are finished, showing that there must be a neat fit. The only way he can arrive at this dimension is by adding up other dimensions to get the over-all distance, and then subtract 4 in. plus 7¾ in. at one end, and 2 in. plus 3¾ in. at the other end. This gives him the omitted dimension from *A* to *B*.

NOTATION OF BEVELS

In asking for bevels the draftsman many times gives them either all in degrees or else in inches. Of course, in either case they can be readily converted—that is, if the workman knows how to do it, or has a converting table. To save this extra work, the draftsman will find upon investigating that the structural shop prefers to have the bevel given in inches as at *A* in Fig. 3, while the machine shop can use the degrees to better advantage, as in Fig. 4. In some instances, in either the structural or the machine shop, both ways will save time.

Fig. 1 is a simple example of continuous dimension. In laying out the two angles, 2½ x 2½ x ¼ in. x 6 ft. 2½ in., the workman will place his tape on the left hand end. He starts with the 1¾-in. dimension for the first hole. For the next he will add 7-15/16 in. to 1¾ in., which will give him the second hole. And so on for each consecutive hole. By the method used in the upper line of dimensions he is forced to add each space in his head. In the lower line of dimensions, this work is all done for him in the drawing room. The arrow points, when they are placed at one end of the dimension line pointing from left to right, designate continuous dimensions. It might be said that this would mean more work for the detailer, and add many figures to the drawing; but as the method works out, it is found that it is not necessary to give the upper line of dimensions at all. The continuous dimension line furnishes all the necessary information.

In using this method the dimensions must start at the left hand and continue towards the right. Few people think it important that in marking off iron from a drawing that the left hand side is the best side to work from. But the rule and tape line control this entirely, as these tools are laid out from left to right, and to work otherwise with them would be using them upside down.

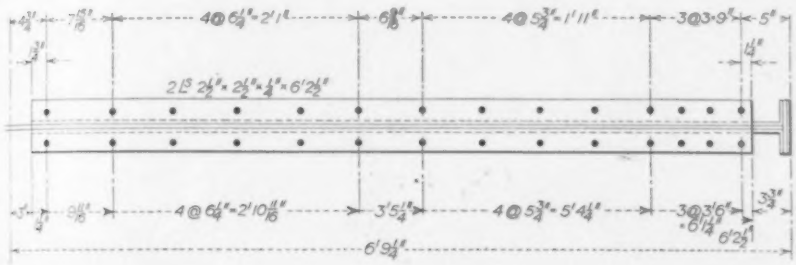


Fig. 1

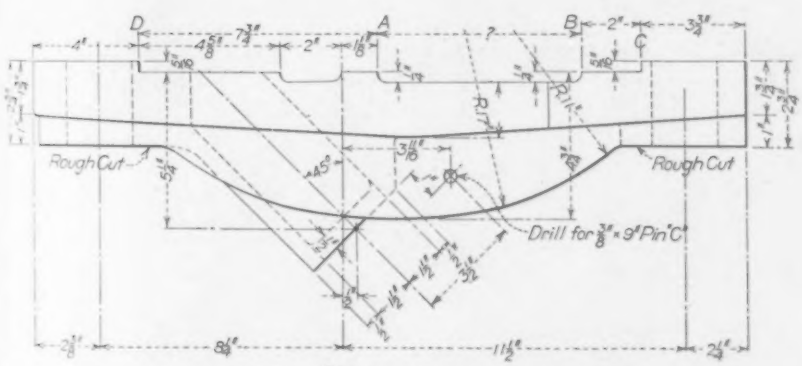


Fig. 2

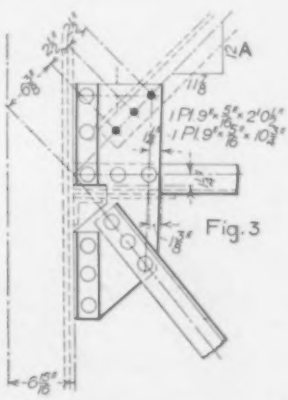


Fig. 3

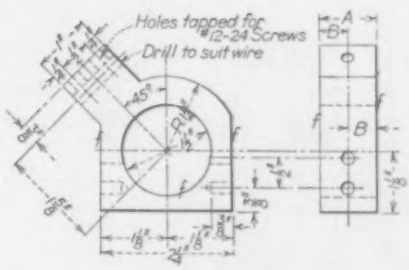


Fig. 4

Examples to Point Out the Value of Designations on Drawings to Fit the Needs of the Shop

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In plants where heavy material must be handled from one point to another outside of the buildings where there is no crane service, a heavy capacity platform car is found excellent for doing this work. Its platform should be built strong enough and with the correct hight of coupler so that it will couple with the ordinary standard railroad equipment and locomotives. The Watertown Arsenal recently purchased a number of cars of this type from the Orenstein-Arthur Koppel Company, Koppel, Pa. These cars are of 30 tons' capacity, all steel, and have full-sized couplers and draft gear, but are only single truck cars with a length of 16 ft., hence are comparatively light as compared with standard gauge double truck car and therefore can be moved easily, either by a pinch bar or a horse when a locomotive is unavailable.

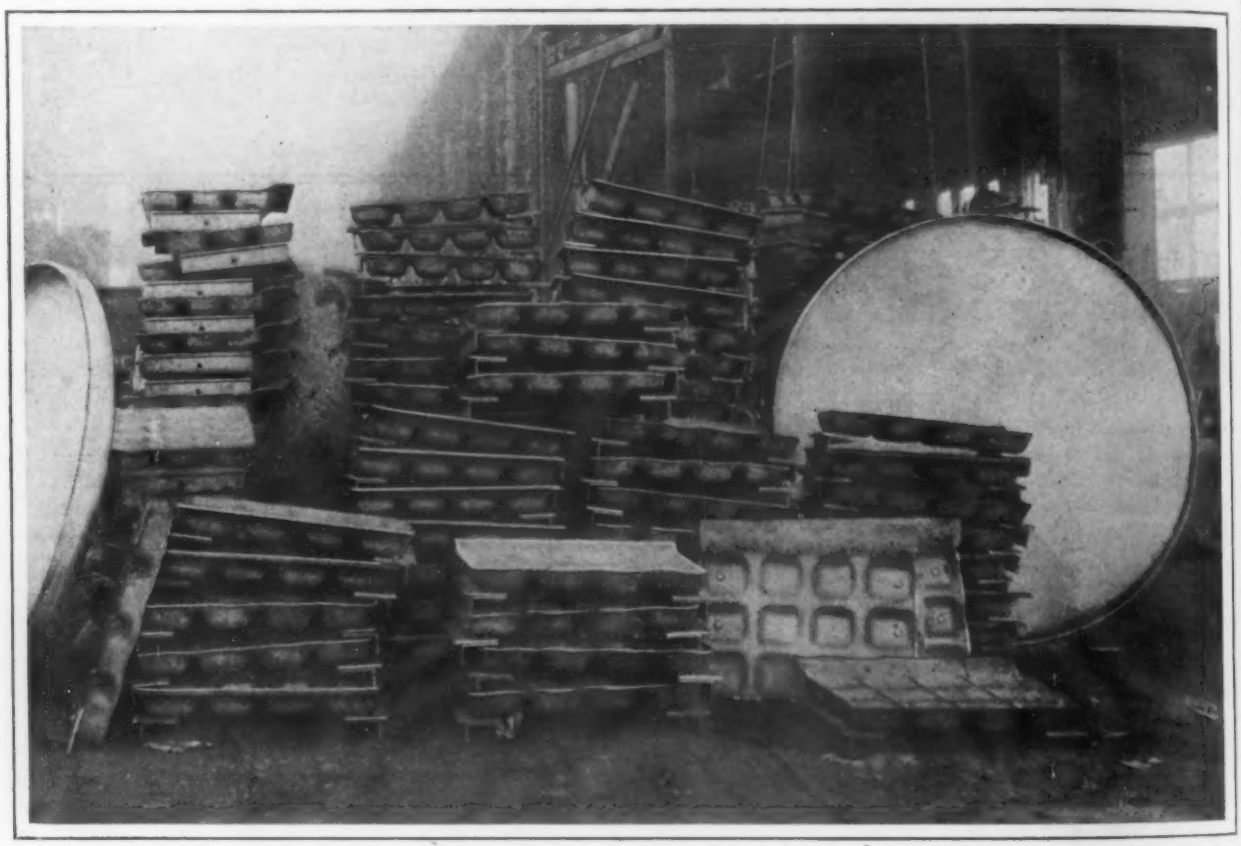
Making a Profit on Special Equipment

Reducing the Idle Hours of Machines by Arranging for Custom Work between Plants—The Idea Extended to Heat Treating, Laboratories, Etc.

BY C. A. TUPPER

Among the many problems confronting a plant manager, one of the most difficult and annoying is that of the idle hours charged against special equipment. This does not necessarily mean machines of unusual design; but in almost every large metal-working establishment and numerous smaller ones apparatus has been installed which is used intermittently for certain service and stands idle the remainder of the time. Examples of this are stamping and punching presses, forging machinery, heading and pointing machines, automatic burring machines, wire drawing blocks, special screw machines, hydraulic forging presses, drop forging machines, upsetting presses, drawing and forming machinery, and facilities for both light and heavy plate work, perforating, rivetting, welding, galvanizing, painting, plating, polishing, etc., as well as pattern-making and foundry work. Die work is another illustration, and there are many others that can be thought of in connection with any particular line of industry. In most cases this equipment represents considerable investment, occupies a good deal of space, requires the retention of skilled operatives, calls for expensive power appliances and additional power capacity, and yet forms an indispensable part of the plant as a whole. It should shoulder its proportionate share of the overhead burden, but seldom does, as the idle hours run up the unit costs to such an extent that the true figures appear to be beyond reason and are almost invariably cut down on one excuse or another.

With good management, however, it is possible to relieve this condition, or, in fact, to reverse it entirely. Special tools or facilities can frequently be kept in practically continuous service and made to yield an additional revenue as a sort of by-product to the regular work of the plant. This is because there are almost always other plants within easy reach, perhaps in the immediate vicinity, which really need similar facilities, but have been debarred from putting them in, for themselves, either on account of the investment required or owing to the fact that they have not enough work of the kind to warrant the extra expense. Some of the latter concerns buy plates, sheets or other material already prepared, which they are able to adapt to their use, or, in the case of operations that need to be performed in their own shops, find means of accomplishing them with other apparatus which may be principally used for altogether different purposes and has been designed accordingly. Such expedients, however, are almost invariably uneconomical and often block desirable improvements in the products turned out; so, where special facilities can be interchanged at reasonable rates, the benefit is mutual. In some industries this idea has, within the past few years, been worked out on a very practical basis; and it would surprise many plant managers who consider themselves progressive to learn the names of some of the large representative concerns that make a systematic canvass for custom work for equipment which, in their own service,



Special Contract Work on Wood Dishing Press

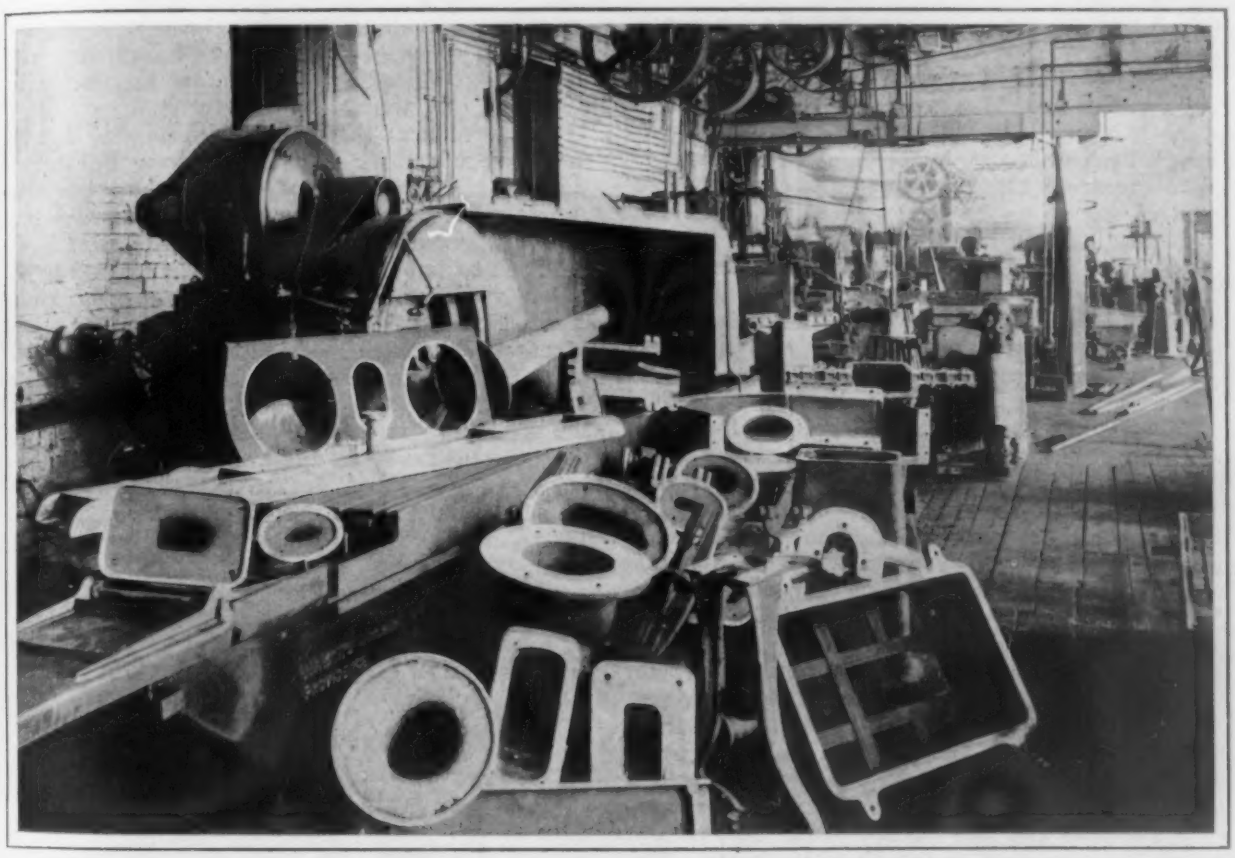
would only be used a part of the time. It would pay any shop superintendent having special tools, intermittently operated, to inquire into the possibilities of the plan as affecting his own plant.

More than that, however, the interchange of the improved facilities afforded by special tools and the consequent increase in their earning capacity, reduction or elimination of standby losses, etc., results in their much wider use and creates a more extensive market for them. All this, in turn, exerts a stimulating influence on the tool market in general and has a marked tendency towards lowering production costs for all classes of material affected.

In this connection some examples of the interchange of facilities, both large and small, may be of interest. All have come within the writer's observation.

The management of a shop manufacturing metal specialties had long debated the advisability of putting in a special type of stamping press capable of working on large blocks of light laminated iron sheets, but the expense had hitherto held it back, when one day the superintendent saw the announcement of a press of this type offered for sale by another company only a few streets away. Visiting the plant of the latter, he found that the machine was just what he wanted; but, even at second-hand, the cost was still prohibitive. The owners, however, had decided to dispose of it, not because they did not have work for the press, but owing to the fact that there was not enough of it. A special large order, which had originally induced them to purchase the machine in order to make sure of finishing within contract time, had been disposed of, and their ordinary work could be done on other machines at slightly greater expense. The result of the superintendent's visit, however, was an agreement by which the owners of the press retained it and took the contract for doing the block stamping of the neighboring plant. This meant an operating economy for both.

A company doing heavy plate work was obliged to carry in stock comparatively large quantities of steel sheets, up to the largest sizes turned out by the mills, and frequently it had calls from customers for perforations in certain of the sheets used for various purposes. Originally it tried keeping these on hand; but, with the increasing sizes of tanks, drums, reservoirs, screens, etc., and irregular construction, it was impossible to keep in stock everything that was needed, and special orders were delayed in fulfillment; so the question came up repeatedly as to whether it was not necessary to provide special facilities for heavy plate perforating. Before a decision was reached, however, the manager learned of a plant in the same city having just the equipment needed, which was only intermittently used for its own work. He called on the latter and readily made an arrangement to send over sheets for perforating whenever required. This has now been in force for several years, with very satisfactory results. The sheets are mostly taken and brought back by motor truck, the perforating is quickly done, even for the most irregular spacing of the holes; and they are frequently cut, trimmed and shipped out on the same day that an order is received, or, if flanged and welded also, by the following day. The company having the perforating equipment, taking the hint given it, looked for other work and found an abundance of it in the immediate locality, which is a large manufacturing center, and its facilities are now crowded to capacity. By keeping its bookings well ahead for work that is not "rush," the regular operations of the plant are not interfered with.



Contract Work on Diamond Grinder of Special Design

A company which, not long ago, put on the market a new type of heater, was confronted with the problem of having one part dished. To turn each part out separately would be slow and costly, but

even then this operation would not keep a press busy week in week out; so the manager conceived the idea of having the work done in multiple on some large dishing press, used ordinarily for heavy work, and then cutting the dishings apart. He figured, also, that by this method a certain number could be just gotten out of a standard size sheet, thereby eliminating considerable waste in cutting. Looking about he found a plant, not far distant, which had a heavy dishing press, and his work was gladly taken in at a very reasonable rate. The accompanying photograph shows a pile of these dishings cut six to a sheet. At the writer's last information, they were still being turned out in the same manner.

An electrical concern, manufacturing certain small, wire wound devices for use in high tension circuits had provided for heavy outside insulation; but, with increasing voltages, the cases of burnout and other trouble reported by customers got to be so frequent that the reputation of the makers was seriously threatened. Investigation by an outside expert disclosed the fact that the interior insulation between windings was not sufficient, and impregnation under pressure was recommended. To install a complete impregnation system, however, would be very expensive, particularly as the device in question, while forming a necessary part of the equipment furnished by the company, constituted only a small part of its output in volume. The difficulty was solved by application to a company building electric generators, motors and transformers, for which an impregnation plant was an absolute necessity. This concern readily undertook the work on a custom basis and has since solicited similar contracts, to keep its plant going to capacity.

The rapidly growing use of special grinders for machining operations has brought about a condition in many places where these rigs can be used with sufficient economy, even for part time, to justify their installation; but an abundance of work exists in every industrial community that might be obtained for such machines to fill in every hour of shop operation, particularly in handling odd shapes. The second reproduction of a photograph shows some of the work of that character turned out on a Diamond grinder of special design.

Facilities for annealing, hardening and heat treatment of all kinds are also capable of being shared by plants in the same community, and a large part of the investment necessary for first-class facilities can be returned to the owners in a relatively short time by taking custom work. The same idea can also be extended to laboratory service, facilities for making micro-photographs, physical and chemical testing, etc. There is no reason why any spare time afforded in the use of costly apparatus for any of these purposes should be locked away from possible service for others. On the contrary, besides the remuneration to the owners, the progress of the metal industries will be just that much advanced, with benefit to all concerned.

Pattern making departments and foundries connected with machinery building plants have probably led the way in the utilization of what would otherwise be idle space and equipment, and the tendency not to allow either to go to waste is increasing. These establishments present a little different side to the problem than that specifically referred to above, inasmuch as they come into direct competition with jobbing plants; but, whatever may be thought of that, they have set an example that should be followed by manufacturers having special facilities that are not now being utilized to the fullest extent possible. Upon these the writer would urge the advisability of "looking around."

Comparative Tests of Lineshaft Bearings

Results of comparative tests on three types of lineshaft bearings are contained in a paper read at the recent annual meeting of the American Society of Mechanical Engineers, by Carl C. Thomas, professor of mechanical engineering, University of Wisconsin. It reports experimental determinations of the absolute and relative amounts of power required to drive a specially constructed series of shafts, carrying uniformly distributed known loads. The shafts were supported successively by ring-oiled babbitt, roller and ball bearings, the same number being used in each case. A wide range of loads and speeds was covered and the coefficients of friction were worked out for each type of bearing. These tests, extending over a period of four years, were made at the University of Wisconsin, and all questions of possible lack of alignment, non-uniformity of loading, temperature and quality of lubricant, etc., were given careful study.

As a result of these tests it was found that the power required for babbitt bearings was higher than for the others, except perhaps at low loads and speeds and that the power for roller bearings was higher than for the ball type. The excess of power required by babbitt over roller bearings and by the latter type over ball bearings increases with an increase of speed for all loads. The relative amounts of power consumed in friction by the three kinds of bearing at speeds of 100 and 300 ft. per min. and temperatures of 77 and 100 deg., are given in the accompanying table. The relative numbers are based in each case on the average power for three loads of 710, 1210 and 1710 lb. for ball bearings, 740, 1240 and 1740 lb. for roller bearings, and 730, 1230 and 1730 lb. for babbitt bearings.

Relative Amounts of Power Consumed in Friction

	100 ft. per min.		300 ft. per min.	
Bearings	77 deg.	100 deg.	77 deg.	100 deg.
Ball	1	1	1	1
Roller	2.2	2.5	2.7	3
Babbitt	3	3.6	4.5	4

To observe the performance of the bearings under extraordinarily heavy loads, breakdown tests were run on each type of bearing with only one section of shafting on which were four bearings. This small number was used because it was impracticable to keep a close watch on a larger number and avoid trouble during the excessively severe conditions. In this case a constant speed, 200 r.p.m., was employed, and this figure was chosen because it represents about the average lineshaft speed in practice. Tests began at about 3200 lb. per bearing and failure occurred at about 4250 lb. per bearing in the case of the babbitt bearings, 4650 lb. for the ball bearings and about 5100 lb. in the case of the roller bearings. The bearings in any case did not fail structurally, as the power was cut off soon after distress was manifested, but the failure was simply that of the lubricant. Breaking down of the lubricant resulted in immediate increase of the power required to maintain the original speed of rotation of the shaft in the bearings. It is pointed out as a result of this test that the quality and the amount of lubricant used undoubtedly has an important effect upon the load that will cause a given bearing to fail.

A Year's Operation of a Gas Producer Plant

The Cost of Fuel, Attendance, Supplies and the Overhead at One of the Works of the A. O. Smith Company, Milwaukee

Some interesting figures on the cost of operating a gas producer plant at the Twenty-seventh street works in Milwaukee, Wis., of the A. O. Smith Company, manufacturer of automobile parts and steel stampings, have been obtained from F. J. Rode, chief engineer of the company. The figures are here presented in tabulated form and show that for the year the cost of operation was 0.634 cent per kw.-hr., and, including the fixed charges, not over 1.104 cent per kw.-hr., with a power factor of 0.71.

The plant includes two 400-kw. units driven by 24 x 36-in. gas engines built by the Allis-Chalmers Company, Milwaukee. One of these was installed in 1910 and started that year, and in 1911, when the load had increased, the second unit was installed.

One Year's Operation of a Gas Producer Power Plant at Factory of A. O. Smith Company, Milwaukee, Wis.

Month	Hours of plant running	Tons of coal consumed	Cost of coal consumed	Cost of attendance	Cost of supplies	Output kw.hr.	Cost of operation per kw.hr., cent.	Cost of fixed charges per kw.hr.	Total cost, cent per kw.hr.	Cost of operating including fixed charges	Load factor during time of operation
January ...	568	267.7	$930.00	$767.75	$109.75	325,400	0.556	0.279	0.835	$2,707.50	0.715
February ..	500	241	903.75	810.40	96.22	284,230	.636	.321	.957	2,710.37	.71
March	554	272	980.00	601.60	87.40	296,620	.565	.301	.866	2,569.05	.665
April	304	168.4	586.00	407.65	63.80	190,700	.556	.464	1.020	1,957.45	.78
May	470	220	792.00	571.95	43.40	236,700	.612	.382	.994	2,318.87	.71
June	244	140	504.00	437.45	48.64	142,000	.697	.633	1.33	1,890.09	.73
July	235	185	660.00	405.45	43.10	134,000	.825	.660	1.485	2,008.55	.715
August	205	110	396.00	396.25	26.10	98,200	.836	.916	1.752	1,718.35	.60
September ..	230	125	450.00	405.45	34.00	133,000	.670	.677	1.347	1,789.00	.712
October	240	173.5	605.00	422.50	35.20	152,810	.700	.590	1.30	1,960.60	.79
November ..	215	163.5	590.00	396.55	32.30	144,990	.705	.620	1.325	1,918.85	.837
December ..	235	178	624.00	383.65	24.60	159,120	.680	.590	1.270	1,932.25	.815
Total.....	4,000	2,244.1	$8,020.75	$6,006.55	$644.51	2,297,770	....	....	.....	$25,472.00	....
Average per month ...	333.33	187	669.33	500.54	53.73	191.480	0.634	0.470	1.104	2,122.00	0.71

Cost of operating, 1913, $14,672; cost of depreciation, taxes, interest and insurance, $10,800, or $900 per month; total, $25,472.

The gas producer plant includes two producers made by R. D. Wood & Co., Philadelphia, each of 400 hp. rating, and two producers made by the Smith Gas Power Company, Lexington, Ohio, rated at 350 hp. Up to 1912 the plant was operated on hard coal of both buckwheat and pea sizes, but as hard coal prices had gone from $4 to $6 per ton, it was decided to operate the plant on soft coal. First Illinois coal was considered, as this could be delivered at $2.90 per ton at the plant. After experimental operation on different kinds of coal, including West Virginia Splint, Indiana, Illinois and Hocking Valley coals, Hocking Valley nut coal was found to deliver the largest number of kilowatt hours for one dollar. The heat value of the gas averaged 160 B.t.u. per cubic foot, and Sunday Creek Hocking coal showed results as low as 1.5 lb. per kw.-hr., although the average in 1913 was near 2 lb. per kw.-hr.

A saving on cost of operation of 0.3 cent per kw.-hr. was effected by changing to soft coal. The price of the coal varied in 1913, but at the present time the coal is delivered to the gas producers at $3.50 per ton. The changing from hard coal to the soft coal required a few modifications in the Smith producer equipment. The Smith static tar extractors, already described in these columns, were installed, and, according to Mr. Rode, was the second equipment of its kind. It was found reliable and simple, and that any degree of cleanliness of the gas could be obtained. On tests the gas cleaned with the apparatus contained only one hundredth of the amount of tar as compared with the best results that have been obtained from the old type of rotary washers.

The tar is burned under steam boilers which are used for drop forging and heating purposes, and no credit was allowed to the gas plant, although Mr. Rode explains that 9½ lb. of water were evaporated per pound of tar burned at the boilers. The accumulation of tar varies somewhat with the volatile matter in the fuel. The Hocking Valley coal now being used runs from 80 to 100 lb. per ton in the Smith producers. Waste water is used for scrubbing and no charge is made in the record for the water. The waste heat of the gas engine exhaust is utilized, the boiler plant being supplied with the jacket water, which is pumped through gas engine exhaust heaters, and all the excess water is sprayed and cooled for reuse. Repair costs are included in the items of the cost of operating attendance and the cost of supplies. Mr. Rode feels that the only drawback to an otherwise eminently satisfactory equipment is the load factor, which varied to such an extent that probably better results could have been obtained had it remained nearer 0.80 instead of the 0.71 average.

Pennsylvania Industrial Board

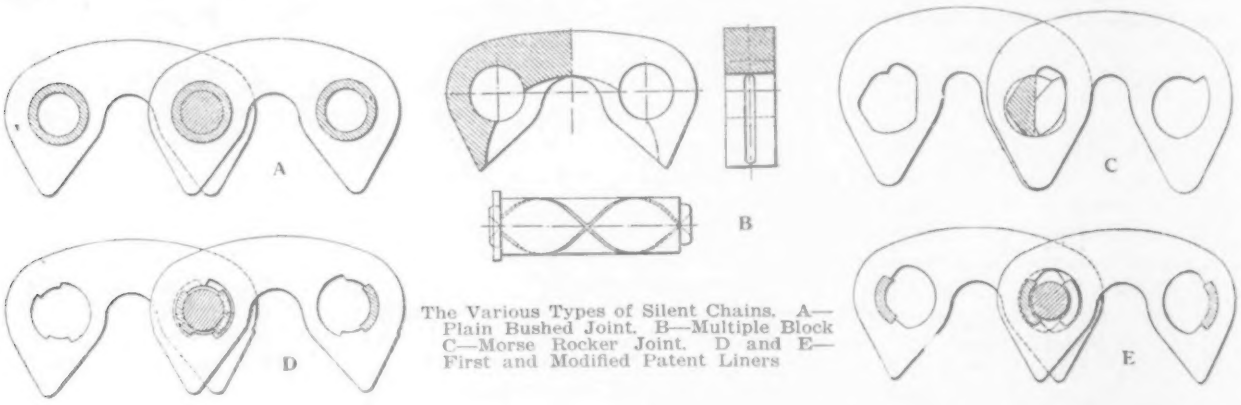
An industrial board has been named for the State Department of Labor and Industry under provisions of the act of Assembly creating the department in 1913, by the governor and will immediately undertake the duty of making rules and regulations for state supervision of industrial plants. The board is primarily charged with the enforcement of inspection laws and to rule on situations which may arise under them. It is to meet monthly and has wide powers for investigation, including the right to require the production of books and papers. Safety, sanitary and general welfare conditions will be studied.

The members named are as follows: George W. McCandless, Pittsburgh, of the McConway & Farley Company, Pittsburgh, representing employers; Frank C. Cronin, president Central Labor Union, Philadelphia, representing employees; Mrs. Samuel Semple, Titusville, president State Federation of Women's Clubs, representing women; George S. Comstock, Mechanicsburg, manufacturer and past-president Engineers' Society of Pennsylvania. Commissioner of Labor and Industry John Price Jackson is ex-officio chairman of the board.

CHAIN POWER TRANSMISSION*

The Development and Future of the Types in Use at the Present Day

The silent chain, patented by Hans Renold in 1895, consists of a series of flat plates with working faces formed upon them and fitted with bushes or bearings of some type or other and strung together upon a stud. The angle between the working faces is usually 60 deg., and these working faces engage with the tooth form of the wheel, which is a plane surface. The working face of the chain engages with the working faces of the wheel teeth on a larger pitch circle and between the position of the chain when it is new and deeply in engagement and its position when it is in danger of riding over the tops of the teeth, there is no change in the method of gearing and the efficiency is unaffected. This fixes the useful life of the chain, and the aim of the designer must be to make the wear of the bearings proceed slowly until the limit of permissible extension is reached and to make the depth of the teeth as great as possible, so that the permissible extension may be increased.



The Various Types of Silent Chains. A—Plain Bushed Joint. B—Multiple Block C—Morse Rocker Joint. D and E—First and Modified Patent Liners

DESIGN OF SILENT CHAIN LINKS

The important features in the design of link form are the pitch, the angle between the working faces, and the radius of the tangency circle, or the distance from the centre of the pin to the working face. The pitch or distance between the studs will depend upon the power that the chain may be required to transmit and upon the range of speeds that it will operate at. When the pitch is fixed by the speed the required strength is obtained by varying the width of the chain. For higher speeds smaller pitches must be used, and where exceptionally smooth turning is required it is necessary to use wheels with a large number of teeth and a shorter pitch. A chain-wheel is not a perfect circle, but a polygon having as many sides as the wheel has teeth. The angle between the working faces most commonly used is 60 deg. Other angles have been tried, but 60 deg. is found to give the most useful range of wheels.

The minimum number of teeth is fixed by the shape of the teeth, and by the impact of the link in coming into gear with the teeth. It is inadvisable to use even so few teeth as 15, especially at high speeds. It has been observed that silent chains running on such small wheels at high speeds wear out rather rapidly, and this is probably due to the fact that the impact between the links and the tooth faces at entering has a damaging effect on the bearings. Where the linear speed of the chain will exceed 1000 ft. per min. there should be not less than 17 teeth in the pinion, and 19 will give a quieter drive and greater durability, assuming the face angle is 60 deg. If the face angle be greater a satisfactory tooth form, from a design point of view, can be obtained on a pinion with a smaller number of teeth, but the considerations of impact, above referred to, would preclude its use. With a face angle of less than 60 deg., the minimum number of teeth in the pinion will be greater, and then another consideration comes into operation—the maximum number of teeth that it is desirable to use in any drive. This is fixed at 120 teeth. If a more acute angle be used between the working faces of the link and a pinion obtained having a larger number of teeth, we shall probably obtain rather quieter running, but the speed ratio between the shafts will be reduced.

With regard to the maximum number of teeth that can be used in the other wheel, it has already been stated that the life of the chain is limited by the difference between the radii of the pitch circles on which the chain runs, when it is new, and when it is just on the point of riding over the tops of the teeth. This difference depends upon the depth of the teeth. The depth of the teeth is independent of their number. It is found that with the depths of teeth generally used a chain that has its pitch extended by 2 per cent. will just begin to ride over the tops of the teeth in running on a wheel having 120 teeth and 2 per cent. extension of pitch is a convenient figure to fix upon from the point of view of chain condition.

Each of the working faces of a link is at the same distance from the centre of the adjacent bearing. Each pin is common to the links of the two pitches it connects, and the corresponding tangency circle of these links coincides. The working faces of the connecting links are tangents of the same circle, and as these working faces lie on adjacent wheel teeth, the latter are also equi-distant from the pin centres. The effect of increasing the radius of the tangency circle will be to increase the size of the links and reduce the size of the teeth. As the latter is done it is necessary, for the sake of strength, to limit the hight to which the chain can climb in adjusting itself for increase in pitch, and this limits the life of the chain. A reduction in the radius of the tangency circle will affect the design of the pin, and a compromise is necessary.

Assuming that the pitch, the angle between the working faces and the radius of the tangency circle are fixed, it is possible to complete the shape of the link. The throat must be sufficiently high to clear the tops of the teeth under any condition that might occur. This will also have its own effect upon the elasticity of the chain. If it extends considerably higher than the line connecting the centres of the

*From a paper read before the Manchester Association of Engineers, by H. T. Hildage, January 10, 1914.

bearings, the chain will be very elastic, and this property is sometimes a valuable one, making for softness and smoothness of running, as well as silence and efficiency. The inner face of the link must be at such an angle that it can under no condition, either entering or leaving, come into contact with the teeth. It has been found by experiment that under reasonable conditions there will not be a backward bend of the chain on entering or leaving the wheel greater than 15 deg., so that the inner faces of the links can be designed with this in view. That portion of the outer edge of the link contiguous to the working faces must be of such a curvature that with the same backward bending it also will clear the teeth. The back of the link must be decided in conjunction with the shape of the throat, because this will fix the strength of the link.

THE DIFFERENT TYPES OF CHAINS

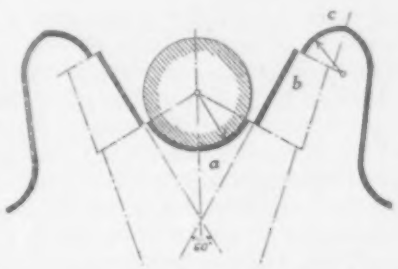
The bearings should be designed entirely from a durability point of view. The expression that this consideration has been given by different makers is shown in the different types of bearing that have been used. In the first form of silent chain the links were punched from steel strips and hardened. The studs were plain, circular pins. It is interesting to note that some chain drives made with this type of bearing lasted as long as 15 yr.

The next type of bearing was what is known as the bush type. Steel bushes were forced into the links, each connecting two or three plates. This construction is shown at A. The pin was a plain steel pin, case hardened. This type is still used by one firm entirely, and by another for the smaller sizes of chains, from $\frac{5}{8}$-in. pitch downward.

The firm that originated the bush bearing found it difficult to obtain accuracy when two or more flat plates were strung together on the same bush, and it was not possible at the time to punch the links from material heavy enough to make them from a single plate, and so another design was adopted. Steel bars were obtained, cold drawn to the required section, and the chain was made up of blocks sawn from these bars and case hardened, the pins still being plain pins of mild steel, case hardened. In this design special attention was paid for the first time to lubrication in the bearings. Slots were cut in the links, giving access to the pinholes from the inside, as shown at B, and oil grooves were turned on the pins. This type of chain is expensive but durable. Some drives that were fitted 15 yr. ago are still running with the first chains, showing few signs of wear. Each of the above-mentioned designs was originated by the firm that obtained the first patent for silent chain-gearing, Hans Renold, Ltd.

The rocker joint bearing was patented by E. F. Morse, Trumansburg, N. Y., in 1893. It is shown at C, and it is seen that the idea of a pin and a journal bearing has been departed from, a knife edge rocking on a plane being substituted, the idea being probably that if there were no rubbing there would be no friction, and consequently no wear. The sectional pins are made from cold-drawn steel bars, and hardened. While the underlying idea of eliminating friction is excellent, this type of bearing has not fully realized this feature in practice. It makes a very durable type of chain, and has given very good service indeed, especially under unfavorable conditions, such as hot and dusty atmospheres and absence of lubrication.

The patent was granted to J. M. Dodge for a liner type of joint in 1904. The bearing consists of a case hardened steel pin turning between segmental bushes, each of which is fixed in one combination of the chain. Originally cold-drawn strip stock was used for the links, and the form of holes was as shown at D. This design is still in use in the United States. Later the links were placed side by side in pairs, with a view to fixing the liner in the link, and ultimately much heavier plates were used for the same purpose with much success. At the same time the shape of the hole was improved by Hans Renold, Ltd., the total effect of these improvements being to give a much more flexible chain, a greater possibility of backward bend and a more nearly perfect attainment of the desire to fix the bush or liner in the link. This link is shown at E. It is obvious that the underlying idea of the liner bearing is to increase the bearing area and thus retard wear. The liners are made from strip steel and case hardened, and the pins also are case hardened.



Sketch Showing the Elements of the Form of a Sprocket Wheel Tooth for Use in Connection with a Roller Chain.

The bush roller chain was invented in 1880 by Hans Renold. It is so called because the bearing consists of a pin and bush knuckle joint, with a roller running on the outside of the bush to relieve the friction between the chain and the wheel at entering and leaving. The pin is carried by one pair of side plates, and the bush by the adjacent pair, the roller running freely on the outside of the bush. The pin and bush are fixed in their respective side plates, that the motion of bending will be taken up in the bearing proper.

In gearing with the chain wheel the teeth of the wheel pass between the side plates of the chain and engage with the rollers. There is probably no doubt about it that in a new chain at any rate the action of the roller is not so much in relieving friction between the chain and wheel teeth as in absorbing impact.

DESIGN OF ROLLER CHAINS AND WHEELS

The gearing element in this type of chain is the roller. The stud must be of such diameter and length that it will give sufficient bearing area to transmit the power or pull required efficiently. The outside diameter of the bush will have its own effect on the shape of the link head into which it is fixed. A certain amount of impact is transmitted to the bush by the roller, but the bushes rarely suffer on this account. An excessively large roller would give an impossibly small tooth. On the other hand, the internal diameter of the roller is fixed by the diameter of the stud, and the roller must be stout enough in thickness to resist the impact.

The exact form of the wheel teeth has been the subject of careful study and experiment. The requirements are substantially the same as for silent chain gearing—namely, that impact at entry shall be a minimum, that movement of the chain after entry, with regard to the teeth, shall also be a minimum, and that small increases in pitch of the chain, due to wear, shall not affect the fulfilment of these conditions. A good many different tooth forms have been in use with different makers at different times, but the gap that seems most nearly to fill the above requirements is shown dissected in the accompanying sketch.

It consists of: (*a*) A root circle equal to the roller diameter, or a few thousandths larger; (*b*)

two straight lines at 60 deg. to one another, forming tangents of that circle, and (*c*) an arc of a circle or circles joining on to these tangents and forming the top of the tooth, determining its hight.

When the chain is new and of correct pitch the roller falls into the root circle, and the impact is taken by a considerable portion of the circumference of the roller, also by a considerable area of the wheel. If the chain is worn somewhat the incoming roller comes in contact with the tooth surface at an acute angle; the incoming roller strikes a glancing blow on the tooth of the wheel, with the result that injury to the roller or to the wheel is minimized and noise reduced.

When the chain is worn one of the rollers beds down into the root of the gap, and the others take up positions on the straight flank, which depend on the amount of extension of pitch and their distance from the roller that is bedded down. The position of the bedded-down roller depends on the relation between the tension on the slack side of the chain and the tension on the driving side, and there is consequently a certain amount of movement between the roller and the wheel teeth while in engagement. It is evident that the bedded-down roller is at the point of least pressure between chain and wheel, and consequently this motion does not induce much friction or cause much wear. Evidently the same kind of thing occurs with the silent chain; the unimportant character of the motion is shown by the fact that very little, if any, tooth face wear occurs in normally designed drives.

The curves which form the upper portion of the teeth are so designed that on entering and leaving the roller does not touch them at all, but comes right in, and is lifted right out of its final position without rolling or sliding.

Can Big Business Be Permanently Dissolved?

Woe to the Nation Which Fails to Apprehend the Natural Causes Behind the Development of World Business

BY HAROLD V. COES, S. B.*

The country today is facing one of the most intricate economic problems with which it has had to deal for some time—probably the largest since the Civil War. This problem is the proper regulation of corporate business, and is composed of a number of factors, as is the case in any complex proposition. Many business and professional men have called attention in divers channels to one or more of these factors, some of which are economic, some legal, some psychological, some scientific, some historical. The present chaotic business condition, which our lack of understanding of this question has entailed, is probably due to the fact that the relative importance and proportion of these factors have been lost sight of—in other words, we have lost our point of perspective and our sense of proportion.

PRESERVATION OF PROPER BUSINESS CONDITIONS

We have been laying great stress on the need of conservation of our national resources (upon which practically all scientifically trained men agree) and now we should equally bend our efforts toward the conservation or preservation of our greatest asset, namely, proper fundamental business conditions. The writer wishes to be particularly clear on this point and to be by no chance misunderstood. He is not defending the unworthy features of our present business conditions, for he believes that these should be corrected as quickly as possible, but he is championing all that is justifiable, right and proper in them.

There can be no doubt in the mind of any careful thinking man that some of our so-called trusts or big business interests have committed crimes morally and technically that should be censured, but that is certainly no more justification for the wrecking of business in general than would be the injury of the health of a child by punishment because of anything it may have done. The writer believes that generally the so-called trusts or big business interests are fundamentally good, the same as he believes that fundamentally most children are good. There are exceptions to this rule, but ruthless destruction of, or injury to either one, is proof of irrationality and the lack of appreciation of the factors entering into the problem.

VIVISECTION OF THE COUNTRY'S BUSINESS

Consider first the psychological factors that are more or less merged with the political factors; for one of the prime causes of our present difficulty is political agitation. This vivisection of the country's business conditions and business interests by political agitation dates back to the year 1907, when the railroads first suffered from restrictive legislation (some of which was rational and some irrational), and has increased up to the present moment, when it has practically affected our whole industrial fabric. In fact, this agitation has actually assumed in some sections of this country a form of hysteria, until not only railroads, and the enterprises more or less dependent upon them, but public utilities, corporations and private enterprises have been included in the attacks.

This condition, then, is psychologic in that the people have been influenced, as a body, by demagogic misstatement of facts, in a great many instances, and have lost their individuality and power of thinking for themselves. Consequently, they have practically sanctioned political agitation, whereas individually, they take a more conservative view. It is doubtful whether there is a conservative business man in the State of Illinois, for instance, who would like to have his business regulated by legislators of the caliber depicted in some of that State's recent sensational political trials, and yet these same legislators elect members for the upper house at Washington upon whom devolves the responsibility of preserving our business integrity. Of what, pray tell, does the legislator of the class designated know about political economy or the

*Member American Society of Mechanical Engineers; member Efficiency Society.

fundamental laws and principles upon which our whole industrial structure is built?

BIG BUSINESS NOT A FUNGUS GROWTH

It is necessary, therefore, that we should fully recognize the fact that the so-called trust or big business combination is an economical development; is the product of the times and has been made possible by such agents as the telephone, telegraph and railroad—by all those agents which tend to annihilate time and distance, and, in fact, by anything that facilitates transportation or assists in spreading or communicating intelligence. Big business is, therefore, not a sporadic or fungus growth, as some would have us believe. That its organization is not perfect is due to our ignoring the fact that it is here to stay. Do away with the natural agents, steam and electricity, return to the conditions of the time of our grandfathers, and the trust or big business automatically crumbles away.

Frequently when a man starts in business of late he soon discovers, except in special instances, that to expand as he would wish he has not the capital, the brains or the physique to carry on the business by himself. He must have the capital, the brains and the physical aid of others. The business increases, interstate markets are tapped, then intercontinental and finally world or international markets are reached, as the natural agents at man's bidding reduce more and more the effects or limiting conditions of time and space.

Our embryonic business organization must consequently be expanded and perfected to deal with the situation. We are not only going to have big business in the sense of a national or international business, but as the markets of the world are brought closer and closer together, as men of every clime learn how to work together, and live together, we are going to have world business, and woe be unto the nation that through politics, degeneracy, hysteria or misguided policies attempts to disrupt or throw out of balance these conditions.

In the writer's opinion, therefore, the efforts of the Federal Government through its Department of Justice to regulate the big interests of the country are futile. It is difficult to see how the recent decisions of our Supreme Court in the well-known Standard Oil and Tobacco cases have helped the situation. It would seem, if the Government is to be successful in its policy, that it must deal with the fundamentals and must destroy the various natural agents which have made these things possible. In other words, we are trying to violate laws just as inexorable economically as are the laws of gravitation or those of the universe.

INDUSTRIAL LEGISLATION NOT A NEW ISSUE

What we need is equitable, just, sane and in a certain sense, elastic regulation. There is a rather prevalent idea that industrial legislation is a new issue, but this is erroneous. Various legal regulations have been attempted throughout the whole history of industry, and in what is known as the "Factory Era" we have the first piece of modern factory legislation passed in England in 1802 after a fight led by such men as Peel, Owen and Oastler. Times have changed. A greater, a more subtle and more acute conscience is present in business affairs, in the body politic. Our ideals have changed; things we did fifteen years ago, justified then in the name of business, are not tolerated now. The world is progressing; we are suffering from growing pains. Why for sins of omission or commission of ten or twenty years ago should we strangle business today? Let us analyze the problem, get at the facts, get the necessary mechanism, keep the wheels and gears of business running in their proper channels, eliminating defective parts as they appear, but regulating constructively, not destructively.

Effect of New Tariff Shown by Figures

Figures compiled by the Statistical Bureau of the New York Custom House, as of January 1, 1914, show that since the new tariff became operative there has been no enormous increase of foreign goods in this market despite some fears to the contrary. The one exception to be noted is in the case of woolens. In bonded warehouses in the district of New York (including Perth Amboy and Newark, N. J., and Albany, N. Y.) on December 31, 1913, was free and dutiable merchandise to the value of $58,130,008, as compared with $56,294,308 at the close of November, 1913. The total value of such merchandise in warehouses on January 1, 1913, was $45,129,178.

The following table shows substantial, but not tremendous increases in the quantities and values of a few iron and steel and metal products on hand at this port at the end of December, 1913, as compared with the end of December, 1912:

Material	Quantity		Value	
	Dec., 1913	Dec., 1912	Dec., 1913	Dec., 1912
Aluminum, crude, lb..	198,805	159,538	$93,145	$26,544
Antimony, contents, lb.	1,697,764	1,303,846	78,014	73,037
Forgings, anti-friction ball bearings	.....	.....	247,684	84,721
Iron, bar, lb.....	386,219	153,717	6,919	3,194
Steel ingots, bars, etc., lb.	4,125,565	2,831,854	132,146	95,927
Machinery	.....	.....	233,130	197,870
Iron or steel, sheet, plate and taggers, lb.	42,421	31,842	962	817
Sheets, wares, etc., enam.	.....	.....	2,842	3,329
Wire and wire articles	.....	.....	20,004	10,399
Iron, various manufactures	.....	.....	60,087	31,359

It will be seen that the volume of steel ingots, bars, etc., in particular, was much larger at the end of 1913. This probably was due in large part to the heavier importation of various tool and high speed steels, several firms having laid their plans long before the new tariff went into effect for supplying American consumers with steel of English, German and Swedish manufacture.

The American Electrochemical Society, New York section, will hold a joint meeting with the New York sections of the American Chemical Society and the Society of Chemical Industry, at the Chemists Club, 52 East Forty-first street, New York City, on the evening of February 6. The subject for consideration will be "Undeveloped Elements," to be discussed as follows: "Opening Up the Field of Unused Elements," Dr. Charles Baskerville, professor of chemistry, College of the City of New York; "The Present Status of Cobalt," Dr. H. T. Kalmus, director research laboratory, School of Mines, Kingston, Ont.; "The Present Status of Boron," Dr. E. Weintraub, director research laboratory, General Electric Company, West Lynn, Mass.; "The Present Status of Tungsten," Dr. R. W. Moore, research laboratory, General Electric Company, Schenectady, N. Y. By "undeveloped elements" is meant those elements which are available as by-products or otherwise in excess of present demand. Discussion will not be limited to the actual papers presented.

Alfred E. Norton announces the incorporation of A. E. Norton, Inc., for the purpose of finishing uncompleted contracts of the Alfred E. Norton Company, now in course of liquidation, and to continue to operate in structural steel lines at 145 West Fortieth street, New York.

ESTABLISHED 1855

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EDITORS

GEO. W. COPE A. I. FINDLEY W. W. MACON

CHARLES S. BAUR, *Advertising Manager*

New Steel and Pig-Iron Capacity

Careful study may well be given the presentation of new steel making and pig-iron making capacity made in the January 1 issue of *The Iron Age*. While the general review of new construction occupied several pages of interesting matter, the figures as to open-hearth and blast-furnace capacity may be summarized as follows:

New Open-Hearth Steel Furnaces.

	Annual Capacity. Gross Tons.
Completed in 1913	2,920,000
Under construction	2,530,000
Total	5,450,000
New Blast Furnaces.	
Completed in 1913	495,000
Under construction	430,000
Total	925,000

The actual production statistics show that the relation between the production of basic pig iron and basic open-hearth steel ingots and castings has been as follows, in percentages of pig iron to steel:

	Per cent.		*Per cent.*
1897	52.7	1905	52.5
1898	50.1	1906	52.0
1899	47.4	1907	52.4
1900	42.1	1908	57.1
1901	40.0	1909	61.5
1902	45.2	1910	59.5
1903	43.0	1911	58.0
1904	48.5	1912.	58.1

Assuming for argument that the relation of 58 per cent. pig iron to steel which obtained in 1911 and 1912 were to be continued, the 925,000 tons annual capacity of blast furnaces built in 1913 or now building would support 1,600,000 tons of open-hearth steel capacity, whereas the new construction shown above is 5,450,000 tons, or 240 per cent. greater. Computing in the other direction, the 5,450,000 tons of steel-making capacity would call for 3,150,000 tons of blast-furnace capacity, whereas the new blast furnace capacity is barely 30 per cent. as great.

The assumption necessarily would be based on the idea of allowing all the new blast furnace capacity to feed open-hearth furnaces; in other words, to allow no more pig iron than formerly to the Bessemer steel industry or to the iron foundries.

It is necessary to consider whether there was, prior to 1913, an excess either of blast furnace or of open-hearth steel making capacity. Recalling the conditions surrounding the burst of mill and furnace activity which culminated in the early months of 1910 the statement can be made that at that time the open-hearth steel making capacity of the country was fully engaged, while there was a lack of employment at Bessemer steel plants, and a superfluity of blast furnace capacity probably about equivalent to such idle Bessemer capacity. There was not much idle blast furnace capacity, but there was furnace capacity in blast unnecessarily, as the accumulation of merchant stocks indicated quite clearly in a short time.

The excess of open-hearth steel construction over blast furnace construction at this time can be met in two ways: (1) By a permanent disappearance of a certain amount of Bessemer capacity; (2) By a greater use of scrap in the open-hearth.

It is quite impossible to attempt a forecast of the competitive position of Bessemer steel in future, in view of the market vagaries which occur now and then. For instance, in the past month or six weeks, instead of Bessemer steel going begging in all quarters, it has commanded a higher price in the sheet bar form than has basic open-hearth steel; and in some cases, though possibly not very many, the Bessemer steel has been bought even at the price disadvantage. For certain uses there is a preference for Bessemer steel, but on the other hand the Bessemer steel manufacturers do not show much eagerness to dispose of their product in competition with open-hearth. They insist, when the market is low, that they cannot afford to follow the open-hearth material down to its cost limit.

In a discussion of the lowness of scrap prices in *The Iron Age* of November 20, 1913, it was pointed out that the trade is now feeling the effects of the very large increase in steel production which occurred some 15 years ago. If the average life of the steel which comes back as scrap were 15 years, the lowness of scrap prices was readily explained, through a large increase occurring in the outcome at a time when the demand is temporarily restricted. The period of return is frequently taken at more than 15 years, however, and if so we are likely to see further important increases in the outcome of old material in the next few years.

It is somewhat doubtful, however, if the increased outcome of old material can fully take up the great difference between new open-hearth steel construction and new blast furnace construction which has been shown by our summary. The open-

hearth steel capacity is 5,450,000 tons and the blast furnace capacity 925,000 tons. Assuming that the additional steel-making capacity itself produces 18 per cent. of new scrap, there is still 3,550,000 tons difference to be taken up in one way or another. Now it is a fact that the outcome of old material is nearly always over-rated. The old material used in open-hearth steel making is really only a relatively small fraction of the total scrap thus used, by far the larger tonnage being the new scrap which is produced in the plants, or in factories which fabricate the product of the steel plant proper. An increase of a single million tons in the outcome of old material is a big item, and an increase year after year of a million tons a year is more, probably, then there is any reason to expect at present. There is reason to conclude, therefore, that unless there has lately been a great excess in blast furnace capacity, relative to the consuming ability of steel works, there will be, in the next couple of years, more employment for blast furnaces, relative to steel works activity, than has been the case in the past few years.

If the outcome of scrap in a period of general activity were to be measured by the rate of outcome in recent months, the scrap supply would fall down hopelessly as soon as the consuming mills reached a stage of measurably full employment. This, however, is not the case. In periods of low prices such as have lately obtained some material is held back, but more important than this, the scrap production, whether the material is actually brought into the market or not, undergoes a curtailment greater than the curtailment in steel consumption. This is by reason of the fact that as the total activity in steel consumption lessens the consumption in large works of replacement, etc., undergoes the greater decrease. Railroad cars are an example. The consumption of steel which involves no measure of replacement is more steady, as, for instance, the consumption of wire, sheets and tin plates. Thus in the next period of general activity the outcome of old material is likely to increase much more, as compared with the record of the past four months, than the production either of pig iron or of new steel.

Starting a Piece-work Operative

It is sometimes a problem to the manager of a shop having the piece-work system to get an accurate gauge of the value of a new employee. Usually it is necessary to start a young operative on the hourly wage basis, because in the beginning he cannot earn enough, working by the piece, to maintain himself. There comes a time when he can be promoted by placing him among the piece workers. The question often arises as to when he is entitled to make the additional income.

An old New England house which manufactures cutlery has employed for years a simple system which gives an accurate record of the work of young employees. A boy is given an hourly wage. Record is made of his production daily. If he is capable, his output should increase from week to week, as he familiarizes himself with his work and becomes deft in the handling of machinery and tools. Presently he is so proficient that at the piece price he is equaling his daily wage. A record card shows his progress.

For illustration, the boy receives a dollar a day and in the beginning produces five pieces, the price of which is ten cents each. The company is paying a dollar and he is giving it 50 cents worth of product, as compared with other operatives. After a time his output is ten pieces, putting him on the piece-work parity. His card shows this, but he is not yet considered entitled to promotion. He gets up to 12 pieces a day and then perhaps to 13, but he still gets only $1, until finally his cards show that his average cost to the company from the time he began his employment is approaching that of ten pieces a day. Then he is considered eligible to the list of piece workers, and from that time he gets a return for his labor that is measured only by his output.

The company has trained him, at some expense to itself in the beginning, but averaging up fairly as between employer and employee in the long run. The record quickly shows the beginner who has not the industry or native skill which would warrant keeping him. It would make no difference under this system whether a boy were started at $1 a day or $1.50 a day, provided he continued in the work until the average was reached.

Selecting and Rating Men

Evidence is accumulating that an increasing number of employers are trying to standardize methods of hiring men and promoting them. As partial success is realized, these plans in greater or less detail will appear. Certainly some system ought to be good and practical, even where employment is given on a large scale to workers on the low rounds of the ladder. When the authors do not attempt too much and when their schemes seem not too complex they will have attentive audiences. Supplementing vocational guidance among school pupils —a movement now rapidly gaining ground—with rational placing of applicants in proper positions is auguring much for contentment in shops and for efficiency.

One enthusiast over the possibilities of the physiological and the psychological analysis of the worker, or the applicant for work, has perhaps been misunderstood. The impression became general that the color of one's hair or his skin foredoomed him to certain kinds of work, but this seems merely a small part of the story. Instead the physiognomy is expected to reveal only some of the characteristics of the employee. Just as one has facts and figures in a matter of engineering to form the basis of a safe and economical decision, so he is justified in using data obtained by prolonged study of the worker as a basis for rating employees, with a minimum dependence on his own uncharted and unscientific and often time-shortened reasoning.

Some of the suggestions carried away from the recent meeting of the Efficiency Society were these: The employer should formulate what are the requirements of the jobs he has to offer. He should likewise formulate the requirements of the men to hold them. He should in the preparation of these codes, so to speak, familiarize himself

with general analyses of these subjects, now obtainable in printed form. In filling positions of more than ordinary importance he may, by the use of his table of requirements, check up the applicant in a more thorough manner than by the common method of depending on impressions. An employing officer may have almost unerring acumen in these matters; but even such a man may have bias and therefore may well build his estimates on a platform which eliminates the personal equation.

Proper use of the employing analysis gives not only an insight into the aptitudes of the applicant but also a line on his character, and character has been hard to ascertain, except in a very general way, by present methods of individual judgment. It appears also that the applicant's previous experience should not be given too great weight, but his qualifications should be noted solely for the job to be filled. In this there is a recognition of a policy now in vogue in some factories not to dismiss a man summarily for admitted shortcomings in a given detail of work, but to place him at some other task which may prove to be exactly the one he can do well. Here the scheme of rating men proves its value, as also in the matter of promotions.

A suggestion of the meeting mentioned was that a list of qualifications should be drawn up so that the foreman could mark men in matters other than output. Other things being equal, trustworthiness, resourcefulness and initiative, for example, should count for something, and the idea was brought out that each such general classification could be subdivided into a number of questions of positive and negative import; thus the reporter could check the question applicable to each case and keep his own feelings from entering to any extent at all. What has been said above is rather the suggestion of possibilities than any attempt to be specific, but certainly there is reason to believe that industrial management is to be helped materially by those who have set out to make so discriminating an investigation of the human element in industry.

Correspondence

Industrial Arbitration Boards

To the Editor: The decision of the last important arbitration board that sat in judgment on a wage dispute between employee and employer gives an advance of 7 per cent. to the former, being about one-half of what was demanded. This award but emphasizes the fact that labor has everything to gain and nothing to lose by arbitration. Capital, on the contrary, has no choice but to lose. This statement might seem incorrect at first blush as a board might award no advance. However, it might happen that industrial conditions would warrant a reduction of wages, and on appeal to the arbitration board there is every chance that no decrease would be allowed. This conclusion is reached by a study of the formation of the board. We find these boards as a rule made up of an equal number from each side to the dispute, with a third member or group of members either selected jointly or by some government official. Experience has shown that almost invariably the neutral section of the board sides with the labor organization. In fact, in the instance referred to above the representatives of the employers filed a minority report. The reasons for the board dividing in this manner are two-fold. First, in these controversies the public without a question assumes that the workingman is the injured party, the underdog as it were. Secondly, it is easily conceivable that the neutral members, because of a total absence of familiarity with the industry are unable to comprehend the other side of the argument and do not grasp its application to the matter under discussion. On the contrary, labor's argument is simple. It wants more money first, because of the cost of living, and, secondly, because the other side is making too much money anyway.

If we are going to have boards the membership must be unbiased. We thus work around to the proposition that the best thing to do is to copy the Canadian act for the investigation of industrial disputes. It is hardly possible to conceive of the Canadian Parliament ever having been more open-minded than when it adopted this statute, which is mainly the product of the master mind of MacKenzie King.

It may require superhuman effort to divert our stalwart statesmen's gaze from the elusive vote long enough to pass such a measure, but this has occasionally been accomplished. The element in the Canadian law which vitalizes it is that the board does not make an award but *fixes the responsibility.* As the author of the Canadian act has well said, contestants without number would settle their differences rather than submit them for public contemplation.

H. D. MURPHY.

Jersey City, N. J., January, 1914.

Manganese Sesquifluoride

To the Editor: Since the publication of my article on "Prolonging the Life of the Bessemer Process in *The Iron Age* of January 22, I have received a number of letters from various parts of the country asking me where manganese sesquifluoride could be secured for experimental purposes. (Of course, only experimental work can be considered as the process is covered by patent applications.)

I would like to state through your valuable publications that I am making arrangements to have a supply sufficient for experimental work placed on sale in this country and expect that it will be available here in a few weeks.

January 31, 1914. L. GOLDMERSTEIN,
29 West Thirty-ninth street, New York.

Announcement has been made that the steel plant at Irondale, near Seattle, Wash., which has been closed down for something over two years, will be rehabilitated and put in operation within 60 days. The plant was formerly owned by the Western Steel Corporation, but through foreclosure proceedings became the property of the Metropolitan Trust Company, New York, which in turn disposed of it to the Occidental Steel Company, New York. This company has made arrangements with the officers of the Pacific Coast Steel Company, of which Judge E. M. Wilson, of Seattle, is president, to operate the plant. It has a capacity of 150 tons of steel bars and shapes per day. T. S. Clingan, manager of the Youngstown plant of the Pacific Coast Steel Company at Seattle, will be the new general manager of the plant.

Steel Corporation Pensions

The total amount paid out of the United States Steel and Carnegie Pension Fund in 1913 was $422,815, compared with $358,780 in 1912 and $281,457 in 1911. The disbursement in the Pittsburgh district last year was $133,885; in the coke regions, $51,130, and in other parts of Pennsylvania, $32,559. In the Cleveland district the pensions paid in 1913 amounted to $40,739, and in other parts of Ohio to $38,427; in the Chicago district they were $14,543, and in other parts of Illinois, $16,552. At Worcester, Mass., the total was $32,698, and in the Lake Superior iron ore district, $19,996. The number of former employees now on the pension roll is more than 2000, and the average monthly pension for those added in 1913 is $20.85.

Pensions and other welfare work of the Steel Corporation are represented in Bulletin No. 4, recently issued by the Corporation's Bureau of Safety, Relief, Sanitation and Welfare. This bulletin, among other pension data, shows the average age at which pensions were granted to be 63.69 years. The average service of the pensioners was 29.14 years. The administration cost has been slightly above 3 per cent. of the disbursements. A group picture is given of 19 pensioners at Worcester, Mass., whose average age last year was 72 and average age when pensioned, 65. The average term of service was 35½ years. The bulletin contains 71 pages, largely devoted to views illustrative of the safety, relief, sanitation and welfare work carried on in the various subsidiary companies. Some of these indicate the noteworthy advance in housing conditions and in the comfort of families of workmen. On one page is shown a group of about 100 workmen at the Homestead Steel Works who own $100,000 of Steel Corporation stock purchased under the employees' stock subscription plan. An important advance apparently has been made in the work of visiting by district nurses, several pages being devoted to illustrations of such work.

Iron and Steel Institute Membership

The amendment recently proposed to the constitution of the American Iron and Steel Institute providing for associate members to the number of 250 has been adopted. Previously the limit of active membership was raised from 1000 to 1250, and 100 applications were then pending. For associate membership about 50 names have been presented, and these will be acted upon at the February meeting of the board of directors.

Brake performance on modern steam railroad passenger trains is to be discussed at the meeting of the railroad committee of the American Society of Mechanical Engineers at 29 West Thirty-ninth street, New York City, Tuesday evening, February 10. A paper is to be presented by S. W. Dudley, assistant chief engineer, Westinghouse Air Brake Company, covering tests made by the Pennsylvania railroad in conjunction with the Westinghouse Company.

The Portsmouth Engine Company, Portsmouth, Ohio, at its annual stockholders' meeting elected the following officers for the coming year: L. C. Turley, president and treasurer, and Guy V. Thompson, secretary. These officers, with H. L. Borcher, C. L. Turley and O. P. Puckett, compose the board of directors.

The J. B. Carr Chain Company, Troy, N. Y., has received the contract for supplying chains to all United States lighthouses during the year 1914. The total amount of the contract will be between $26,000 and $27,000. The chains will be of special steel, stamped with the maker's name, and marked "L. H. S."

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Germany's Exports for Eleven Months

The following table gives some statistics of Germany's exports of iron and steel in November, 1913, and for 11 months ended with November, in metric tons (2204 lb.):

	November		January-November	
	1912	1913	1912	1913
Pig iron	84,701	61,776	968,584	798,546
Scrap	18,389	14,601	142,890	177,414
Semi-finished steel	57,128	66,456	613,804	636,810
Beams	38,992	28,992	449,254	421,459
Other structural shapes	75,467	99,576	763,612	1,056,413
Heavy plates	29,793	36,251	271,203	411,894
Thin plates	12,543	15,236	114,393	133,501
Wire, rolled or drawn, plain	28,380	21,461	257,457	251,016
Wire, polished	12,258	16,681	138,331	166,992
Wire nails	5,372	5,277	49,561	59,772
Tubing	18,644	18,038	154,145	190,816
Steel rails	42,569	38,604	475,103	457,012
Steel railroad ties	24,911	8,840	169,705	117,413

The total exports of iron and steel, including manufactured products, in November were 522,000 metric tons, which was about 66,000 tons less than in October, 1913. The corresponding figures for November, 1912, were 530,000 tons. Exports for 11 months in 1913 reached 5,918,000 tons, as compared with 5,454,000 tons to December 1, 1912, an increase of 464,000 tons.

PIG IRON OUTPUT LESS

January 100,000 Tons Below December

Steel Works Furnaces Fall Off 1200 Tons a Day and Merchant Stacks 2000 Tons

The country's production of pig iron (not including charcoal iron) in January amounted to 1,885,054 gross tons, against 1,983,607 tons in December, a falling off of nearly 100,000 tons. Most of the steel works furnaces banked over the holidays resumed in the first 10 days of January. Others are still idle. Statements of capacity active January 1 and February 1 are less exact than usual, because of the slow working of a good many furnaces in both months and the lack of exact data in some cases as to the number of days furnaces were off. Our capacity rating shows 63,470 tons a day for 197 active furnaces on February 1, against 66,168 tons a day for 206 furnaces counted active January 1, including a number that were then banked with the expectation of resuming in the first week of the year.

DAILY RATE OF PRODUCTION

The daily rate of production of coke and anthracite pig iron by months, from January, 1913, is as follows:

Daily Rate of Pig-Iron Production by Months—Gross Tons

	Steel works	Merchant	Total
January, 1913	63,921	26,251	90,172
February	64,005	28,364	92,369
March	61,448	27,699	89,147
April	64,658	27,101	91,759
May	64,232	26,807	91,039
June	62,002	25,617	87,619
July	59,362	23,239	82,601
August	59,140	22,981	82,121
September	60,941	22,590	83,531
October	59,630	22,503	82,153
November	52,434	22,019	74,453
December, 1913	41,879	22,108	63,987
January, 1914	40,691	20,117	60,808

OUTPUT BY DISTRICTS

The accompanying table gives the production of all coke and anthracite furnaces in January and the three months preceding:

Monthly Pig-Iron Production—Gross Tons

	Oct. (31 days)	Nov. (30 days)	Dec. (31 days)	Jan. (31 days)
New York	158,288	130,198	111,493	101,966
New Jersey	11,236	11,298	11,790	11,341
Lehigh Valley	82,304	78,046	74,766	73,263
Schuylkill Valley	53,130	52,297	62,564	55,831
Lower Susquehanna and Lebanon Valley	50,766	41,032	39,871	37,814
Pittsburgh district	640,819	579,366	469,902	441,688
Shenango Valley	142,136	111,802	74,488	85,076
Western Pennsylvania	132,898	132,029	140,327	127,011
Maryland, Virginia and Kentucky	60,426	54,378	47,893	37,603
Wheeling district	106,462	80,097	78,633	83,193
Mahoning Valley	278,428	244,870	179,530	165,881
Central and Northern Ohio	228,619	169,213	162,702	155,503
Hocking Val., Hanging Rock and S. W. Ohio	37,966	42,561	49,415	41,880
Chicago district	326,973	284,641	247,031	228,439
Mich., Minn., Mo., Wis. and Col.	58,835	47,422	55,012	64,173
Alabama	161,365	160,011	161,554	157,616
Tennessee	15,610	14,342	16,636	16,776
Total	2,546,261	2,233,603	1,983,607	1,885,054

PRODUCTION OF STEEL COMPANIES

Returns from all furnaces of the United States Steel Corporation and the various independent steel companies show the following totals of product month by month. Only steel-making iron is included in these figures, together with ferromanganese, spiegeleisen and ferrosilicon. These last, while stated separately, are also included in the columns of "total production."

Production of Steel Companies—Gross Tons

	Pig, total production			Spiegeleisen and ferromanganese		
	1912	1913	1914	1912	1913	1914
Jan.	1,483,153	1,981,560	1,261,430	22,622	15,633	15,395
Feb.	1,550,995	1,792,154	.....	15,950	20,131	.....
Mar.	1,827,792	1,904,878	.....	11,538	20,546	.....
Apr.	1,830,717	1,939,751	.....	11,104	23,108	.....
May	1,922,557	1,991,192	.....	20,518	19,042	.....
June	1,823,958	1,860,070	.....	26,685	19,212	.....
July	1,803,205	1,840,216	.....	26,522	22,310	.....
Aug.	1,843,404	1,833,352	.....	24,225	20,680	.....
Sept.	1,773,073	1,828,232	.....	22,484	24,555	.....
Oct.	1,947,426	1,848,634	.....	27,252	19,499	.....
Nov.	1,884,524	1,573,007	.....	17,461	26,765	.....
Dec.	1,976,870	1,298,262	.....	18,523	14,095	.....

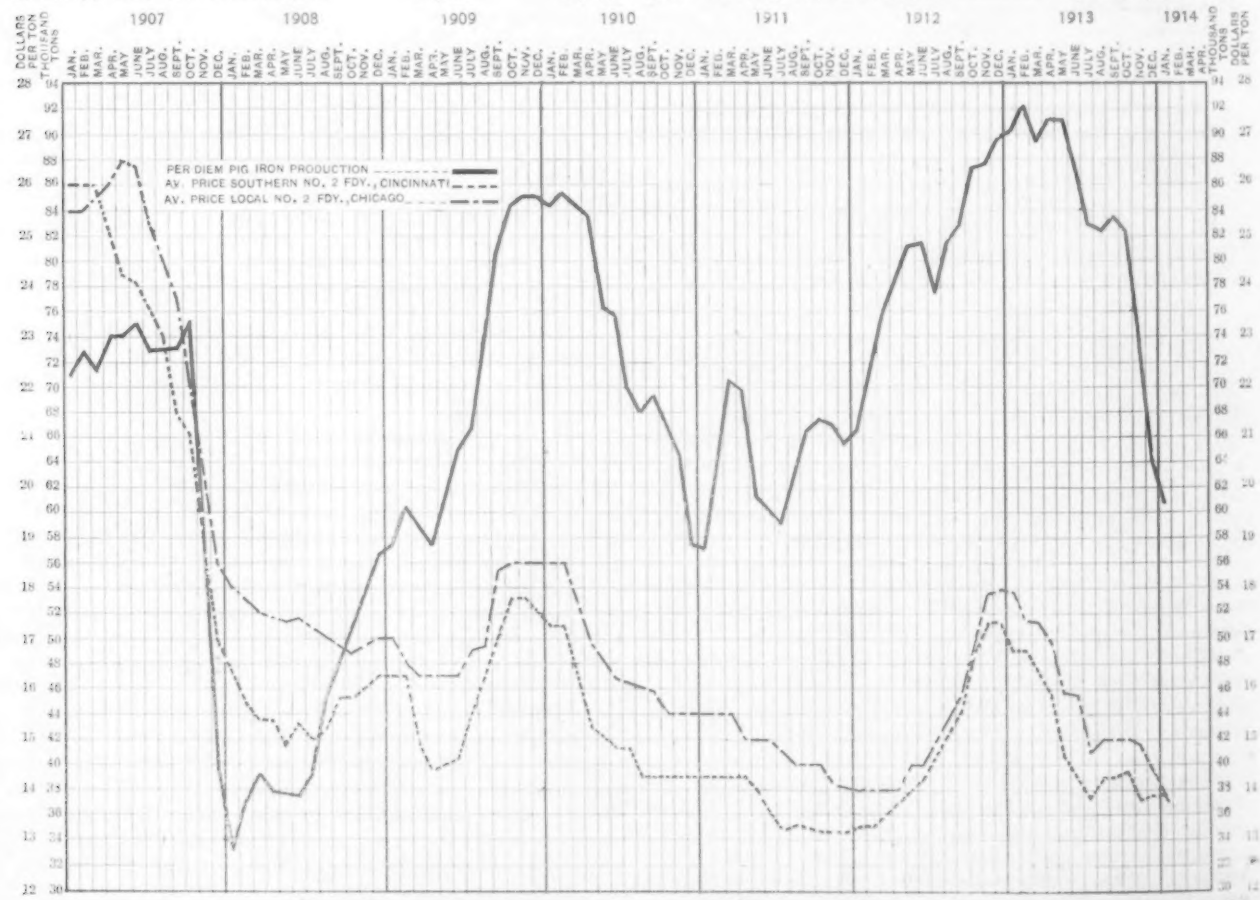


Diagram of Daily Average Production by Months of Coke and Anthracite Pig Iron in the United States from January 1, 1907, to February 1, 1914; Also of Monthly Average Prices of Southern No. 2 Foundry Iron at Cincinnati and Local No. 2 Foundry Iron at Chicago District Furnace

CAPACITY IN BLAST FEBRUARY 1 AND JANUARY 1

The following table shows the daily capacity, in gross tons, of furnaces in blast February 1 and January 1 by districts:

Coke and Anthracite Furnaces in Blast

Location of furnaces	Total number of stacks	Feb. 1 Number in blast	Feb. 1 Capacity per day	Jan. 1 Number in blast	Jan. 1 Capacity per day
New York:					
Buffalo	19	9	2,915	10	3,204
Other New York	7	1	195	2	392
New Jersey	7	2	366	2	380
Pennsylvania:					
Lehigh Valley	22	9	2,360	8	2,278
Spiegel	2	1	85	1	86
Schuylkill Valley	16	6	1,636	8	2,018
Lower Susquehanna	7	2	552	2	490
Lebanon Valley	10	4	668	4	638
Pittsburgh Dist.	52	33	15,385	34*	16,865
Spiegel	4	2	257	2	244
Shenango Val.	19	10	3,373	8	2,580
Western Pa.	27	12	3,985	14	4,527
Maryland	4	0	....	1	290
Wheeling Dist.	14	9	3,287	7	2,633
Ohio:					
Mahoning Val.	25	14	5,615	15	5,987
Central and Northern	24	14	5,145	16†	5,255
Hock'g Valley, Hang'g Rock, & S. W. Ohio	15	10	1,410	11	1,560
Illinois and Ind.	34	17	7,425	19‡	8,145
Spiegel	2	1	160	1	125
Mich., Wis. and Minn.	10	7	1,535	7	1,441
Colorado, Mo. & Wash.	8	2	680	1	339
The South:					
Virginia	24	8	1,010	7	865
Kentucky	5	1	120	1	126
Alabama	46	19	4,765	21	5,163
Tennessee	20	4	541	4	537
Total	423	197	63,470	206	66,168

* 6 of these furnaces banked over January 1.
† 3 of these furnaces banked over January 1.
‡ 2 of these furnaces banked over January 1.

Among furnaces blown out in January were one Wickwire (Buffalo) and Standish in New York State, Leesport and one Swede in the Lehigh Valley, one Aliquippa in the Pittsburgh district, one Cambria and Scottdale in western Pennsylvania, one Maryland at Sparrows Point (banked indefinitely), one Hubbard and Grace in the Mahoning Valley, Newburgh and one Cleveland in northern Ohio, one Calumet in the Chicago district, Tuscaloosa and one Ensley in Alabama.

The list of furnaces blown in includes one Crane in the Lehigh Valley, New Castle No. 1 and one Shenango in the Shenango Valley, Oriskany in Virginia, one Mingo and Martin's Ferry in the Wheeling district, and one Colorado at Pueblo.

DIAGRAM OF PIG-IRON PRODUCTION AND PRICES

The fluctuations in pig-iron production from January, 1907, to the present time are shown in the accompanying chart. The figures represented by the heavy lines are those of daily average production, by months, of coke and anthracite iron. The two other curves on the chart represent monthly average prices of Southern No. 2 foundry pig iron at Cincinnati and of local No. 2 foundry iron at furnace at Chicago. They are based on the weekly market quotations of *The Iron Age*. The figures for daily average production are as follows:

Daily Average Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1907—Gross Tons

	1907	1908	1909	1910	1911	1912	1913	1914
Jan.	71,149	33,918	57,975	84,148	56,752	66,384	90,172	60,808
Feb.	73,038	37,163	60,976	85,616	64,090	72,442	92,369	.....
Mar.	71,821	39,619	59,232	84,459	70,036	77,591	89,147	.....
Apr.	73,885	38,289	57,962	82,792	68,836	79,181	91,759	.....
May	74,048	37,603	60,753	77,102	61,079	81,051	91,039	.....
June	74,486	36,444	64,656	75,516	59,585	81,358	87,619	.....
July	72,763	39,287	67,793	69,305	57,841	77,738	82,601	.....
Aug.	72,594	42,851	72,546	67,963	62,150	81,046	82,057	.....
Sept.	72,783	47,300	79,507	68,476	65,903	82,128	83,531	.....
Oct.	75,386	50,554	83,856	67,520	67,811	86,722	82,133	.....
Nov.	60,937	51,595	84,917	63,659	66,648	87,697	74,453	.....
Dec.	39,815	56,158	85,022	57,349	65,912	89,766	63,987	.....

THE RECORD OF PRODUCTION

Production of Coke and Anthracite Pig Iron in the United States by Months Since January 1, 1910—Gross Tons

	1910	1911	1912	1913	1914
Jan.	2,608,605	1,759,326	2,057,911	2,795,331	1,885,054
Feb.	2,397,254	1,794,509	2,100,815	2,586,337	.....
Mar.	2,617,949	2,171,111	2,405,318	2,763,563	.....
Apr.	2,483,763	2,064,086	2,375,436	2,752,761	.....
May	2,390,180	1,893,456	2,512,582	2,822,217	.....
June	2,265,478	1,787,566	2,440,745	2,628,565	.....
July	2,148,442	1,793,068	2,410,889	2,560,646	.....
Aug.	2,106,847	1,926,637	2,512,431	2,545,763	.....
Sept.	2,056,275	1,997,102	2,463,839	2,505,927	.....
Oct.	2,093,121	2,102,147	2,689,933	2,546,261	.....
Nov.	1,909,780	1,999,433	2,630,854	2,233,123	.....
Dec.	1,777,817	2,043,270	2,782,737	1,983,607	.....

Interesting Employees' Families in Safety

The American Rolling Mill Company, Middletown, Ohio, has been working along the lines of greater safety to its workmen, especially in the past five years. Safety appliances and liberal hospital facilities were provided, but it was still difficult to secure their fullest use.

For Saturday night, January 31, the opera house of Middletown was engaged and four reels of moving pictures, showing the process of making tin plate from iron ore, were exhibited to the employees and their families. Between the reels an address was made by Geo. M. Verity, president, outlining the company's policy. He specially emphasized the fact that all industries are making great headway in providing safety appliances and safeguards for workmen of all classes; but if personal responsibility is thereby lessened very little will have been gained. He suggested that the "good-bye" given to employees on leaving their homes for the mills be changed to "safety first."

The company physician, Dr. H. H. Smith, gave an illustrated description of the hospital facilities and told of the assistance the families could give the company in getting employees to make full use of the appliances furnished for accident prevention and the facilities provided for minimizing the results of accidents. When all employees are in the best physical condition possible the hazard of their work will be greatly reduced and their efficiency increased. He urged the housewives to prepare proper food for their husbands and related several instances of what carelessness in this matter had done. Nearly a hundred lantern slides were given of safety devices in various plants of the country.

Blast Furnace Notes

One of the Wisconsin Steel Company's blast furnaces at South Chicago was blown out January 10 for relining. It will be ready for blast again about March 1.

Hannah blast furnace of the Republic Iron & Steel Company at Youngstown, Ohio, was blown in February 2. No. 4 Haselton stack of this company is idle, being relined and repaired, and is expected to be ready for blast about February 15.

Rosena furnace of the Carnegie Steel Company at New Castle, Pa., which has been idle for about three months for repairs, was blown in last week.

At present only one of the four blast furnaces of the Jones & Laughlin Steel Company at Aliquippa, Pa., is in blast. Nos. 1 and 3 stacks have been idle for some time, and No. 2 went out on January 10.

Leesport furnace, Leesport, Pa., was blown out in the second week in January, and meantime repairs are being made to the blowing engine.

The Cambria Steel Company, Johnstown, Pa., put out a second blast furnace in January and six are now in operation. Nos. 1 and 7 are being rebuilt.

One blast furnace of the Lackawanna Steel Company's group at Lackawanna, N. Y., was in operation on February 1.

Four of the National Tube Company's blast furnaces at Lorain, Ohio, were active February 1. Three of these had been banked from late December until the first week in January.

The Burdett Mfg. Company, maker of gas generating apparatus, has moved to new and enlarged quarters at room 382, 50 Church street, New York.

The Iron and Metal Markets

FURTHER PRICE ADVANCES

Five Important Finished Lines Affected

More Steel Works Blast Furnaces Started — Heavy Ferromanganese Buying

Iron and steel markets have gained ground in the past week. January buying was so large and the behavior of prices so satisfactory that with the opening of February producers in several finished lines have announced advances of $1 a ton.

The initiative was taken in each case by Steel Corporation subsidiaries. Wire products were put on a basis of $1.60 for wire nails and $1.40 for fencing wire. In wrought steel pipe discounts were shortened one half point, representing $1 a ton and in oil country products there was a similar advance. On Monday the Carnegie Steel Company announced that its price for bars, plates and shapes for any delivery is 1.25c., Pittsburgh.

While, as has been much emphasized in recent testimony in the Steel Corporation suit, publicly quoted prices are not to be taken as those uniformly paid, there has been a good deal of support for the above advances among independent steel companies. This is particularly true in wire products, wrought pipe and structural steel. Bars have been sold at 1.20c., Pittsburgh, in the past week, and in the Chicago district sales have been made on a 1.15c., Pittsburgh, basis. Plates are still available at 1.20c., Pittsburgh.

Our blast furnace statistics show that a good deal of the January activity at steel plants was based on cold pig iron accumulated in the November-December slump, for furnace output last month was 100,000 tons less than in December. The January total was 1,885,054 tons, or 60,808 tons a day, against 63,987 tons a day in December. Active capacity February 1 was 63,470 tons a day for 197 furnaces, as compared with 66,168 tons a day for 206 furnaces on January 1, some of these latter having banked over the holidays.

February will show an increase in pig iron output. On Monday nine Steel Corporation furnaces, representing 4500 tons a day, were blown in—six of the Carnegie Steel Company, two of the Illinois Steel Company and one of the American Steel & Wire Company, at Cleveland. The Steel Corporation reports 75 per cent. of its ingot capacity in operation this week.

The ferromanganese trade has had an exciting week. From $40, which represented a $5 fall in a week, there were cuts to $37 and $36, seaboard, and in a three days' competition which seems to have been confined to foreign sellers, contracts for about 40,000 tons were booked. Various steel companies closed for the entire year, and some deliveries run into the first quarter of 1915. Among sales reported are 7200, 6000, 5000 and 3000 ton lots to Central Western steel companies. Foreign makers are now reported to be together again at $38, Baltimore.

Scattered rail sales in the case of two companies were over 31,000 tons in the past week, but the large lines are making no haste to get spring rollings. The week's car buying includes 3000 for the Chesapeake & Ohio, 500 for the Union Tank Line and 1000 for the Illinois Central. The Pennsylvania Railroad has ordered 1050 from its own shops.

Structural lettings are rather better. The American Bridge Company has taken 6500 tons for a smelter at Miami, Ariz., and 6000 tons for a department store in Pittsburgh. The larger fabricators, with three or four months' work booked, are refusing to duplicate recent very low prices.

Two tank steamers for the Gulf Refining Company just placed with the New York Shipbuilding Company represent 3500 to 4000 tons of steel apiece. Two tank boats are also to be built at the Union Iron Works, San Francisco.

Foundry pig iron buying was very heavy in January, and some let-up is already indicated for February. Prices are stiffening in Northern districts, and are now from 25 to 50 cents above the low point in early January.

Basic iron has suddenly become active in the Pittsburgh district at advancing prices. A Youngstown steel company has just closed for 35,000 tons for delivery over the first half at about $13 Valley furnace, or 75 cents above the lowest of the month. The same buyer has taken 15,000 tons of gray forge at $12.75 at furnace. At Pittsburgh a steel company has bought about 10,000 tons on the $13 basis.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type, Declines in Italics

At date, one week, one month, and one year previous.

	Feb. 4, 1914.	Jan. 28, 1914.	Jan. 7, 1914.	Feb. 5 1913.
Pig Iron, Per Gross Ton:				
No. 2 X, Philadelphia...	$14.75	$14.75	$14.85	$18.50
No. 2, Valley furnace....	**13.00**	12.75	13.00	17.50
No. 2 Southern, Cin'ti...	13.75	13.75	14.00	16.75
No. 2, Birmingham, Ala.	10.50	10.50	10.75	13.50
No. 2, furnace, Chicago*	**14.00**	13.50	14.00	17.50
Basic, del'd, eastern Pa.	14.00	14.00	14.00	18.00
Basic, Valley furnace...	**13.00**	12.50	12.50	16.35
Bessemer, Pittsburgh....	14.90	14.90	15.15	18.15
Malleable Bess., Ch'go*.	**14.00**	13.50	14.00	17.50
Gray forge, Pittsburgh..	**13.65**	13.40	13.90	17.15
L. S. charcoal, Chicago..	12.25	15.25	15.25	18.00
Billets, etc., Per Gross Ton:				
Bess. billets, Pittsburgh.	**21.00**	20.50	20.00	28.50
O.-h. billets, Pittsburgh..	**21.00**	20.50	20.00	29.00
O.-h. sheet bars, P'gh...	**22.00**	21.00	21.00	29.50
Forging billets, P'gh....	**25.00**	24.00	24.00	36.00
O.-h. billets, Phila.....	22.40	22.40	21.50	32.00
Wire rods, Pittsburgh...	**26.00**	25.50	25.00	30.00
Old Material, Per Gross Ton:				
Iron rails, Chicago.....	13.00	13.00	13.00	16.25
Iron rails, Philadelphia..	**16.50**	16.00	15.50	18.00
Carwheels, Chicago	**12.25**	12.00	11.50	16.75
Carwheels, Philadelphia..	12.50	12.50	12.00	16.00
Heavy steel scrap, P'gh.	**12.25**	11.50	10.50	14.50
Heavy steel scrap, Phila.	11.00	11.00	10.00	13.50
Heavy steel scrap, Ch'go.	**10.25**	9.75	9.00	12.00
No. 1 cast, Pittsburgh..	**11.25**	10.75	10.75	15.00
No. 1 cast, Philadelphia.	**12.50**	12.00	12.00	14.50
No. 1 cast, Ch'go (net ton)	**10.75**	10.50	10.00	12.75

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

	Cents.	Cents.	Cents.	Cents.
Finished Iron and Steel, Per Lb. to Large Buyers:				
Bess. rails, heavy, at mill	1.25	1.25	1.25	1.25
Iron bars, Philadelphia..	1.22½	1.22½	1.20	1.67½
Iron bars, Pittsburgh....	1.35	1.35	1.35	1.70
Iron bars, Chicago.....	1.10	1.10	1.10	1.60
Steel bars, Pittsburgh...	1.20	1.20	1.20	1.70
Steel bars, New York....	1.36	1.36	1.36	1.86
Tank plates, Pittsburgh..	1.20	1.20	1.20	1.75
Tank plates, New York...	1.36	1.36	1.36	1.91
Beams, etc., Pittsburgh..	1.20	1.20	1.20	1.75
Beams, etc., New York..	1.36	1.36	1.36	1.91
Skelp, grooved steel, Pgh.	1.20	1.20	1.20	1.45
Skelp, sheared steel, P'gh.	1.30	1.30	1.30	1.50
Steel hoops, Pittsburgh.	1.30	1.30	1.35	1.60
Sheets, Nails and Wire, Per Lb. to Large Buyers:				
Sheets, black, No. 28, P'gh	1.95	1.95	1.85	2.35
Galv. sheets, No. 28, P'gh	2.95	2.95	2.85	3.50
Wire nails, Pittsburgh...	**1.60**	1.55	1.50	1.75
Cut nails, f.o.b. East'n mills	1.65	1.65	1.65	1.80
Cut nails, Pittsburgh....	1.60	1.60	1.55	1.70
Fence wire, base, P'gh...	**1.40**	1.35	1.30	1.55
Barb wire, galv., P'gh...	**2.00**	1.95	1.90	2.15

Coke, Connellsville, Per Net Ton at Oven:	Feb. 4, 1914.	Jan. 28, 1914.	Jan. 7, 1914.	Feb. 5 1913.
Furnace coke, prompt	$1.85	$1.85	$1.85	$3.00
Furnace coke, future	2.00	2.00	2.00	3.00
Foundry coke, prompt	2.50	2.50	2.50	3.50
Foundry coke, future	2.60	2.60	2.60	3.50

Metals. Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York	15.00	15.00	15.12½	16.50
Electrolytic copper, N. Y.	14.75	14.50	14.87½	16.25
Spelter, St. Louis	5.25	5.20	5.15	6.60
Spelter, New York	5.40	5.35	5.30	6.75
Lead, St. Louis	4.05	4.02½	4.05	4.20
Lead, New York	4.15	4.10	4.15	4.35
Tin, New York	40.87½	39.12½	36.60	48.75
Antimony, Hallett's, N. Y.	7.00	7.00	7.00	9.00
Tin plate, 100-lb.box, P'gh.	$3.25	$3.25	$3.40	$3.60

Finished Iron and Steel f. o. b. Pittsburgh

Freight rates from Pittsburgh, in carloads, per 100 lb., New York, 16c.; Philadelphia, 15c.; Boston, 18c.; Buffalo, 11c.; Cleveland, 10c.; Cincinnati, 15c.; Indianapolis, 17c.; Chicago, 18c.; St. Louis, 22½c.; Kansas City, 42½c.; Omaha, 42½c.; St. Paul, 32c.; Denver, 84½c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 80c. on plates, structural shapes and sheets No. 11 and heavier; 85c. on sheets Nos. 12 to 16; 95c. on sheets No. 16 and lighter; 65c. on wrought pipe and boiler tubes.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in. wide, 1.20c. to 1.25c. base, net cash, 30 days. Following are stipulations prescribed by manufacturers with extras:

Rectangular plates, tank steel or conforming to manufacturer's standard specifications for structural steel dated February 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge, or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gauge or weight, to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras.	Cents per lb.
Gauges under ¼ in. to and including 3-16 in.	.10
Gauges under 3-16 in. to and including No.8	.15
Gauges under No. 8 to and including No. 9	.25
Gauges under No. 9 to and including No. 10	.30
Gauges under No. 10 to and including No. 12	.40
Sketches (including straight taper plates) 3 ft. and over	.10
Complete circles 3 ft. in diameter and over	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive	.05
Widths over 110 in. up to 115 in., inclusive	.10
Widths over 115 in. up to 120 in., inclusive	.15
Widths over 120 in. up to 125 in., inclusive	.25
Widths over 125 in. up to 130 in., inclusive	.50
Widths over 130 in.	1.00
Cutting to lengths, under 3 ft., to 2 ft. inclusive	.25
Cutting to lengths, under 2 ft., to 1 ft. inclusive	.50
Cutting to lengths, under 1 ft.	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and zees, 3 in. and over, 1.20c. to 1.25c. Extras on other shapes and sizes are as follows:

	Cents per lb.
I-beams over 15 in.	.10
H-beams over 18 in.	.10
Angles over 6 in. on one or both legs	.10
Angles, 3 in. on one or both legs, less than ¼ in. thick as per steel bars card, Sept. 1, 1909	.70
Tees, structural sizes (except elevator, hand rail, car truck and conductor rail)	.05
Channels and tees, under 3 in. wide, as per steel bar card, Sept. 1, 1909	.20 to .80
Deck beams and bulb angles	.80
Hand rail tees	.75
Cutting to lengths, under 3 ft. to 2 ft., inclusive	.25
Cutting to lengths, under 2 ft. to 1 ft., inclusive	.50
Cutting to lengths, under 1 ft.	1.55

No charge for cutting to lengths 3 ft. and over.

Wire Rods.—Bessemer, open-hearth and chain rods, $26 to $27.

Wire Products.—Fence wire, Nos. 0 to 9, per 100 lb., terms 60 days or 2 per cent. discount in 10 days, carload lots to jobbers annealed, $1.40; galvanized, $1.80. Galvanized barb wire and fence staples, to jobbers, $2.00; painted, $1.60. Wire nails to jobbers, $1.60. Prices of the foregoing wire products to dealers, in carload lots, are 5c. higher. Woven wire fencing, 74½ per cent. off list for carloads; 73½ off for 1000-rod lots; 72½ off for less than 1000-rod lots.

The following table gives the price to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	0 to 9	10	11	12&12½	13	14	15	16
Annealed	$1.60	$1.65	$1.70	$1.75	$1.85	$1.95	$2.05	$2.15
Galvanized	2.05	2.05	2.10	2.15	2.25	2.35	2.75	2.85

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card on steel pipe in effect from February 2, 1914, and iron pipe from June 2, 1913, all full weight:

Butt Weld

Steel. Inches.	Black.	Galv.	Iron. Inches.	Black.	Galv.
⅛, ¼ and ⅜	72½	52	⅛ and ¼	66	47
½	76½	66	⅜	65	46
¾ to 3	79½	71	½	69	56
			¾ to 2½	72	61

Lap Weld

2	76½	68	1¼	56	45
2½ to 6	78½	70	1½	67	56
7 to 12	75½	65	2	68	58
13 to 15	52½	..	2½ to 4	70	61
			4½ to 6	70	61
			7 to 12	68	55

Reamed and Drifted

1 to 3, butt	77½	69	1 to 1½, butt	70	59
2, lap	74½	66	2, butt	70	59
2½ to 6, lap	76½	68	1¼, lap	54	43
			1½, lap	65	54
			2, lap	66	56
			2½ to 4, lap	68	59

Butt Weld, extra strong, plain ends

⅛, ¼ and ⅜	67½	57	⅜	63	52
½	72½	66	½	67	60
¾ to 1½	76½	70	¾ to 1½	71	62
2 to 3	77½	71	2 and 2½	72	63

Lap Weld, extra strong, plain ends

2	73½	65	1½	65	59
2½ to 4	75½	67	2	66	58
4½ to 6	74½	66	2½ to 4	70	61
7 to 8	67½	57	4½ to 6	69	60
9 to 12	62½	52	7 and 8	63	53
			9 to 12	58	47

Butt Weld, double extra strong, plain ends

½	62½	56	½	57	49
¾ to 1½	65½	59	¾ to 1½	60	52
2 to 2½	67½	61	2 and 2½	62	54

Lap Weld, double extra strong, plain ends

2	63½	57	2	55	49
2½ to 4	65½	59	2½ to 4	60	54
4½ to 6	64½	58	4½ to 6	59	53
7 to 8	57½	47	7 to 8	52	42

To the large jobbing trade an additional 5 and 2½ per cent. is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts to jobbers, in carloads, in effect from January 2, 1914, are as follows:

Lap-Welded Steel		*Standard Charcoal Iron*	
1¾ and 2 in.	61	1½ in.	45
2¼ in.	58	1¾ and 2 in.	49
2½ and 2¾ in.	64	2¼ in.	45
3 and 3¼ in.	69	2½ to 2¾ in.	54
3½ and 4½ in.	71	3 and 3¼ in.	57
5 and 6 in.	64	3½ to 4½ in.	60
7 to 13 in.	61	5 and 6 in.	49

Locomotive and steamship special charcoal grades bring higher prices.

2½ in. and smaller, over 18 ft., 10 per cent. net extra.

2¾ in. and larger, over 22 ft., 10 per cent. net extra.

Less than carloads will be sold at the delivered discounts for carloads, lowered by two points for lengths 22 ft. and under to destinations east of the Mississippi River; lengths over 22 ft., and all shipments going west of the Mississippi River must be sold f.o.b. mill at Pittsburgh basing discount, lowered by two points.

Sheets.—Makers' prices for mill shipment on sheets of U. S. Standard gauge, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms 30 days net or 2 per cent. cash discount in 10 days from date of invoice:

Blue Annealed Sheets

	Cents per lb.
Nos. 3 to 8	1.40 to 1.45
Nos. 9 to 10	1.45 to 1.50
Nos. 11 and 12	1.50 to 1.60
Nos. 13 and 14	1.55 to 1.65
Nos. 15 and 16	1.65 to 1.70

Box Annealed Sheets, Cold Rolled

Nos. 10 and 11	1.60 to 1.65
No. 12	1.60 to 1.65
Nos. 13 and 14	1.65 to 1.70
Nos. 15 and 16	1.70 to 1.75
Nos. 17 to 21	1.75 to 1.80
Nos. 22 and 24	1.80 to 1.85
Nos. 25 and 26	1.85 to 1.90
No. 27	1.90 to 1.95
No. 28	1.95 to 2.00
No. 29	2.00 to 2.05
No. 30	2.10 to 2.15

Galvanized Sheets of Black Sheet Gauge

Nos. 10 and 11	1.95 to 2.00
No. 12	2.05 to 2.10
Nos. 13 and 14	2.05 to 2.10
Nos. 15 and 16	2.20 to 2.25
Nos. 17 to 21	2.35 to 2.40
Nos. 22 and 24	2.50 to 2.55
Nos. 25 and 26	2.65 to 2.70
No. 27	2.80 to 2.85
No. 28	2.95 to 3.00
No. 29	3.10 to 3.15
No. 30	3.25 to 3.30

Pittsburgh

PITTSBURGH, PA., February 4, 1914.

Conditions in the steel trade are undoubtedly very much better, and the market on nearly all lines of products is showing a rising tendency. On Monday, February 2, the Carnegie Steel Company advanced its prices on plates, shapes and bars to 1.25c., minimum; the American Steel & Wire Company on wire products $1 a ton, and the National Tube Company on black and galvanized, butt and lap weld steel pipe one-half point, or $1 a ton, and casing and oil well supplies $1 a ton. Prices on basic pig iron have gone up fully 75c. a ton from the lowest point reached, which was $12.25 at Valley furnace. Bessemer pig iron is up about 25c. a ton, and foundry has advanced to $13 minimum at Valley furnace, with some sellers asking $13.50. There is a heavy inquiry in the market for pig iron, and consumers are now trying to cover on basic at prices 50c. to 75c. higher than it could have been obtained for a week or two ago. Prices on billets and sheet bars are firm at $21 for billets and $22 for sheet bars, Pittsburgh or Youngstown mill. The flurry of last week in ferromanganese is pretty well over, and the market has settled at $37 to $38, seaboard. Wire rods are quoted at $26 minimum, and the leading interest is reported to be asking $27. Selected heavy steel scrap has sold up to $12.50 per gross ton, delivered, in the Pittsburgh district, and borings, turnings and low phosphorus melting scrap are up about 50c. Operations among the steel mills are gradually moving up, and this week are on a basis of about 65 per cent. When it is recalled that all this improvement has taken place with practically no new buying from the railroads it is the more remarkable and indicates strongly the low point reached in stocks. There is no doubt that much of the new buying in finished iron and steel is for replenishment of badly depleted stocks, but it is also true that in some cases sales at the higher prices quoted are being made for second quarter delivery. Consumers are now anxious to cover as far ahead as possible, but the mills report they are still fighting off taking such contracts, insisting that orders placed are not for delivery further ahead than first quarter, except in special cases. There seems to be no doubt that the turn in the steel business has come, and indications point to higher markets.

Pig Iron.—W. P. Snyder & Co. of this city report the average price of Bessemer pig iron in January to have been $14.00 and of basic $12.325, both at Valley furnace. In Bessemer this is a decline of 81c. and in basic 20c. from the December averages. Late in January there were several sales of basic iron at $12.25, Valley furnace, which explains the low general average for the month. The situation in the local pig-iron trade, especially basic and foundry, has undergone a material change in the past week. At present there are inquiries in the market for basic iron aggregating fully 120,000 tons, nearly all the local open-hearth steel interests wanting it for first and second quarter. The Youngstown Sheet & Tube Company has bought 35,000 tons of basic at about $13, Valley furnace, and 15,000 tons of gray forge at $12.75, for delivery through first half. Another Youngstown interest has sold 2500 tons of basic for February and March at $13 at furnace. A local open-hearth steel interest has closed for 8000 to 10,000 tons of basic iron for delivery over the next three or four months at $13, Valley furnace, and may buy 8000 to 10,000 tons more before the week ends. There is some inquiry for Bessemer, one local steel casting company wanting 1500 tons for March-May and another 3000 tons for delivery up to July. There is a heavy inquiry for foundry iron, the Westinghouse Electric & Mfg. Company being in the market for its requirements for the last nine months of this year, aggregating 12,000 to 15,000 tons. The International Steam Pump Company has inquiries out for 16,300 tons of Nos. 1, 2 and 3 foundry iron for delivery over the remainder of this year, but this business will likely go to Eastern furnaces. Other inquiries for foundry iron aggregate 15,000 to 20,000 tons, there being probably 50,000 tons in the market. Several sellers of foundry iron are holding for $13.50 at furnace and say they will not shade this price. So far there has been little done in malleable Bessemer or gray forge. We quote standard Bessemer iron at $14 to $14.25; basic, $13 to $13.25; No. 2 foundry, $13 to $13.50; malleable Bessemer, $13.25; gray forge, $12.75, for first quarter and first half delivery, all at Valley furnace, the freight rate for delivery in the Pittsburgh or Cleveland district being 90c. a ton.

Billets and Sheet Bars.—The billet and rail sales bureau of the Carnegie Steel Company reports that its actual orders and specifications passed in the order department and sent to the mills for rolling in January exceeded December by over 100,000 tons. This company is out of the market as a seller of billets or sheet bars, its obligations being heavy enough to take its entire output over the next three or four months. The two leading Youngstown steel mills have advanced prices on Bessemer and open-hearth billets to $21 and on Bessemer and open-hearth sheet bars to $22, Youngstown. The smaller steel mills are also asking higher prices, and it is doubtful whether they would shade very much the prices named above. We quote Bessemer and open-hearth billets at $21 and Bessemer and open-hearth sheet bars $22, f.o.b. maker's mill, Pittsburgh or Youngstown. Forging and axle billets are strong and slightly higher. We quote forging billets at $25 on desirable specifications calling for one size, and miscellaneous orders calling for various sizes at $26. We quote axle billets at $23 for desirable orders and $24 for miscellaneous orders.

Muck Bar.—While there is no new inquiry, the market is firmer in sympathy with other semi-finished products. We quote best grades of muck bar, made from all pig iron, at $28, Pittsburgh.

Steel Rails.—Disappointment is expressed over the slow manner in which contracts for rails are being placed by the leading roads. It is still believed that some will be closed in the near future, the Carnegie Steel Company has been asked by a number of roads to reserve rolling space for the next four or five months. There is a fair demand for light rails, but a good part of the new business being placed is going to the re-rolling mills. The Carnegie Company received new orders and specifications in the past week for about 2100 tons. We quote splice bars at 1.50c. and standard section rails at 1.25c. Light rails, rolled from billets, are quoted as follows: 25, 30, 35, 40 and 45 lb. sections, 1.25c.; 16 and 20 lb., 1.30c.; 12 and 14 lb., 1.35c., and 8 and 10 lb., 1.40c., all in carload lots, f.o.b. Pittsburgh.

Plates.—The market is firmer. The Carnegie Steel Company is now quoting 1.25c. minimum for delivery over the next several months, but in special cases this price would probably be accepted for second quarter delivery. One other leading interest is quoting 1.20c. on prompt business and 1.25c. for delivery ahead. Car orders are still slow in coming out. The Chesapeake & Ohio placed last week 1000 steel gondolas with the Pressed Steel Car Company, and 1000 steel hoppers each with the Standard Steel Car Company and the American Car & Foundry Company. The Pennsylvania Railroad has placed orders for construction at its Altoona shops for 1000 steel underframe box cars, 50 steel passenger cars and 34 locomotives. The Chesapeake & Ohio is still in the market for 1000 steel underframe box cars. More new orders are being placed for plates than for some time and the two leading local makers report that their mills are running to nearly normal capacity, for the first time in some months. We quote ¼ in. and heavier plates at 1.20c. on desirable orders for reasonably prompt shipment and 1.25c. for delivery over the next two or thre months.

Structural Material.—Inquiry has been fairly active, and a good deal of business is under negotiation. The American Bridge Company has taken about 5000 tons

for the new department store of the Rosebaum Company, this city. Local fabricators are bidding on 1200 to 1500 tons for steel buildings for a new interest near this city. The market on structural steel is firmer, and both local makers are now holding firm at 1.25c. either for prompt shipment or for delivery over the next three or four months. We quote beams and channels up to 15 in. at 1.25c. f.o.b. Pittsburgh.

Ferroalloys.—For several days last week there was quite a lively time in ferromanganese, prices on foreign declining squarely to $35 seaboard, but have since gone back to $37 and $38. A local steel company and a steel interest east of this city were fortunate enough to secure very large amounts at $35, equal to $37.16, delivered, Pittsburgh. The local consumer was originally covered for about six months, but secured 7500 tons or more for future delivery at $35 and the other bought 5000 to 6000 tons or more at the same price. It is claimed that last week there were sold in the Pittsburgh district 40,000 to 50,000 tons of foreign 80 per cent. ferromanganese at $35 to $38, seaboard. It is said that most consumers are now covered over practically all of this year, and a few probably through first half of 1915. The break in ferromanganese prices is ascribed to the entrance of the Carnegie Steel Company into the market some time ago as a seller of domestic. We can state, however, that this company has not followed in the decline of foreign and has been practically out of the market as a seller since the time when foreign ferromanganese was held at $42, Baltimore. We now quote English 80 per cent. ferromanganese at $37 to $38, and German at $38 seaboard. Prices on ferrosilicon are firm, and we note sales of several cars of 50 per cent. for prompt delivery at the full price. We quote 50 per cent. ferrosilicon, in lots up to 100 tons, at $73; over 100 tons to 600 tons, $72; over 600 tons, $71, delivered in the Pittsburgh district. We quote 10 per cent. ferrosilicon at $20; 11 per cent., $21, and 12 per cent., $22, f.o.b. cars Jackson County, Ohio, or Ashland, Ky., furnaces. We quote 20 per cent. spiegeleisen at $25 at furnace. We quote ferrotitanium at 8c. per lb. in carloads; 10c. in 2000-lb. lots and over, and 12½c. in less than 2000-lots.

Wire Rods.—In sympathy with the recent advance of $1 a ton in wire products, wire rods are higher, but consumers are pretty well covered through first half of this year, and there is little new buying. We quote Bessemer, open-hearth and chain rods at $26, but it is understood the leading interest is quoting $27, f.o.b. Pittsburgh.

Skelp.—A good deal of new business was placed recently, and the market is stronger than for some months. One leading maker is now asking 1.25c. minimum on grooved steel and 1.30c. on sheared. We quote grooved steel skelp at 1.20c. to 1.25c.; sheared steel skelp, 1.30c. to 1.35c.; grooved iron skelp, 1.60c. to 1.65c., and sheared iron skelp, 1.65c. to 1.70c., delivered at consumers' mills in the Pittsburgh district.

Iron and Steel Bars.—Prices are firmer. On Monday, February 2, the Carnegie Steel Company advanced its price on steel bars to 1.25c. minimum, for reasonably prompt delivery, but in some cases this price would be accepted for second quarter shipment. As yet the Jones & Laughlin Steel Company is quoting 1.20c. for prompt and 1.25c. for forward delivery. New orders for steel bars in January were heavier than at any time for some months, and specifications were also much larger. We note a heavy demand for reinforcing bars, some large orders having lately been placed. The steel-bar mills are running to fuller capacity now than at any time since last summer. The new demand for iron bars is showing betterment. We quote steel bars at 1.20c. for prompt shipment and 1.25c. for delivery in second quarter. We quote common iron bars at 1.35c. to 1.40c.

Sheets.—The advance of $3 a ton on black and galvanized sheets and $1 a ton on blue annealed made by the American Sheet & Tin Plate Company on January 22 is being firmly held, and intimations are that another advance will be announced by the sheet mills within a short time. The new demand is heavy, and specifications are coming to the mills very freely. Several leading makers state that new orders and specifications in January were heavier than in any month since May and June of last year. The American Sheet & Tin Plate Company is operating close to 85 per cent. of its hot sheet mill capacity and other leading makers are also running nearly full. For delivery in first quarter we quote No. 28 Bessemer black sheets at 1.95c. to 2c. and No. 28 galvanized at 2.95c. to 3c. We quote Nos. 9 and 10 blue annealed sheets for first quarter delivery at 1.45c. at mill; No. 28 tin mill black plate, H. R. and A., 1.90c. to 1.95c.; Nos. 29 and 30, 1.95c. to 2c. These prices are f.o.b. Pittsburgh, in carload and larger lots, jobbers charging the usual advances for small lots from store.

Tin Plate.—Specifications against contracts are heavy and the mills are busier now than at any time in more than six months. The American Sheet & Tin Plate Company is operating to close to 90 per cent. of capacity and may start up in the near future one or two plants that have not been operated for some time. Other mills are running practically full. On the small amount of new business that is being placed we quote 100 lb. cokes from $3.25 to $3.40 and 100 lb. ternes from $3.15 to $3.30 per base box, prices depending on the order.

Shafting.—The new demand is slightly better and makers report specifications from automobile builders and other large consumers heavier than for some time. Nearly all consumers of shafting have practically covered over the first half of this year. We quote cold-rolled shafting in carload and larger lots at 64 to 65 per cent. and in small lots at 62 to 63 per cent. off, depending on the order, delivered in base territory.

Hoops and Bands.—The Carnegie Steel Company has advanced its price on steel bands to 1.25c., but we are advised other makers are still accepting orders for prompt shipment at 1.20c. There is not much new demand for either hoops or bands, as most consumers are covered through the first quarter and in some cases through the first half. We quote steel bands at 1.20c. to 1.25c., with extras as per the steel bar card, and steel hoops at 1.30c., f.o.b. Pittsburgh. It is stated that none of the hoop mills will accept orders for hoops at the 1.25c. price which prevailed until recently.

Bolts and Rivets.—Makers report the new demand for nuts and bolts heavier than at any time in the past six months. Jobbers and consumers are trying to buy as far ahead as possible at present discounts. However, makers believe that prices will improve in the near future and are willing to accept orders for shipment only for 60 to 90 days and some are quoting slightly higher prices for extended delivery. The market on rivets is also stronger, the new demand being better than for some time. Some makers are asking about $1 a ton higher prices. We quote button-head structural rivets at $1.65 to $1.70 and cone-head boiler rivets at $1.75 to $1.80, in carload lots, an advance of $2 to $3 a ton over these prices being charged for small lots, depending on the order. Terms are 30 days net, less 2 per cent. for cash in 10 days. Discounts on nuts and bolts are as follows in lots of 300 lb. or over, delivered within a 20c. freight radius of makers' works.

Coach and lag screws	80 and 20% off
Small carriage bolts, cut threads	75 and 17½% off
Small carriage bolts, rolled threads	80 and 2½% off
Large carriage bolts	70 and 15% off
Small machine bolts, cut threads	80 and 2½% off
Small machine bolts, rolled threads	80 and 7½% off
Large machine bolts	75 and 10 and 2½% off
Machine bolts, C.P.C. & T nuts, small	70 & 12½% off
Machine bolts, C.P.C. & T nuts, large	70 & 12½% off
Square H.P. nuts, blanked and tapped	$6.00 off list
Hexagon nuts	$6.70 off list
C.P.C. & R sq. nuts, blanked and tapped	$5.80 off list
Hexagon nuts, ⅝ and larger	$6.80 off list
Hexagon nuts, smaller than 9/16	$7.40 off list
C.P. plain square nuts	$5.30 off list
C.P. plain hexagon nuts	$5.70 off list
Semi-fin. hex. nuts, ⅝ and larger	85 and 10% off
Semi-fin. hex. nuts, smaller than 9/16	85, 10 & 5% off
Rivets, 7/16 x 6½, smaller and shorter	80 and 10% off
Rivets, metallic tinned, bulk	80 and 10% off
Rivets, tin plated, bulk	80 and 10% off
Rivets, metallic tinned, packages	80 and 10% off
Standard cap screws	75, 10, 10 and 7½% off
Standard set screws	75, 10, 10 and 7½% off

Wire Products.—On Monday, February 2, the American Steel & Wire Company and other leading makers of wire products advanced prices $1 a ton, or

to the basis of $1.60 for wire nails; $1.40 on plain annealed wire; $2 for galvanized barb wire and fence staples, and $1.60 for painted barb wire, per 100 lb., f.o.b. Pittsburgh. This is the second advance of $1 a ton made in wire products within three weeks and reflects the strong condition of the market. However, most large consumers and jobbers covered their requirements for at least 60 days prior to the advance made early in January, and new buying in the past two or three weeks has been only moderate. Specifications against contracts have been heavy, and shipments by the mills in the last three weeks of January were nearly up to normal capacity. At present leading wire mills are operating to 75 per cent. or more of capacity and one or two makers are running nearly full. Cut nails are quoted at $1.60 to $1.65, Pittsburgh.

Railroad Spikes.—A number of Eastern and Western railroads are in the market trying to cover on their requirements for the whole of 1914. Makers, however, are willing to sell at present prices only for delivery in first half. One road has placed 5000 kegs, another about 8000 and a Western road 15,000, the latter contract going to the Chicago district. We quote railroad spikes in large lots at $1.40 to $1.45 and small railroad and boat spikes at $1.55 per 100 lb., f.o.b. Pittsburgh.

Merchant Steel.—New orders in the past week or two have been heavier than at any time in the past four or five months and jobbers and consumers are now anxious to contract for their requirements for the first half of this year or longer. The mills are trying to confine orders for shipment only up to April, but some business has been placed for second quarter. Prices are firmer, and for delivery up to July we quote: Iron finished tire, ½ x 1½ in., and larger, 1.35c., base; under ½ x 1½ in., 1.50c.; planished tire, 1.55c.; channel tire, ¾ to ⅞ and 1 in., 1.85c. to 1.95c.; 1⅛ in. and larger, 1.95c.; toe calk, 1.95c. to 2.05c., base; flat sleigh shoe, 1.70c.; concave and convex, 1.75c.; cutter shoe, tapered or bent, 2.25c. to 2.35c.; spring steel, 1.95c. to 2.05c.; machinery steel, smooth finish, 1.80c. We quote cold-rolled strip steel as follows: Base rates for 1 in. and 1½ in. and wider, under 0.20 carbon, and No. 10 and heavier, hard temper, 3.25c.; soft, 3.50c.; coils, hard, 3.15c.; soft, 3.40c.; freight allowed. The usual differentials apply for lighter sizes.

Standard Pipe.—On Monday, February 2, the National Tube Company and other pipe mills reduced discounts on black and galvanized lap and butt weld pipe one-half point, which is equal to an advance of $1 a ton and casing and oil country goods were also advanced $1 a ton. One leading interest reports that its orders for tubular goods entered in January were the heaviest in any one month since last May. The new demand for steel pipe is active. The Columbus Gas & Fuel Company, Columbus, Ohio, is in the market for 122 miles of 16-in. and 55 miles of 12-in. Makers of iron pipe also report that actual orders entered in January showed a heavy increase over any previous month for some time. Operations among the mills are now on the basis of 80 to 85 per cent. of capacity, and some report they are doing even better. The new discounts on steel pipe effective from February 2 and on other tubular goods are given on a previous page.

Boiler Tubes.—The new demand for locomotive and merchant tubes is only fairly active, both boiler and locomotive shops still being short of work and not buying their usual quantities of tubes. However, in sympathy with the improved demand for other lines of finished iron and steel the mills expect a heavier demand.

Coke.—The market is quiet, inquiry for both furnace and foundry coke being light. Several leading makers say they are holding furnace coke firm at $2, but at the same time admit they are making few if any sales. A leading furnace interest reports that it has been able to pick up considerable furnace coke at $1.75 per net ton at oven, but this price could not be done on contract coke. The improvement in the pig-iron market and the higher prices on basic and foundry iron are expected to help the coke market before long. We quote strictly best grades of furnace coke for first half delivery at $2 per net ton at oven, but some standard grades are offered at $1.85 to $1.90. We quote strictly standard 72-hr. foundry coke at $2.50 per net ton at oven to consumers, but some grades can be had at a lower price. The output of coke in the Upper and Lower Connellsville regions last week was 291,055 tons, an increase over the previous week of 23,000 tons.

Old Material.—The local scrap market is decidedly better. Selected heavy steel scrap has sold as high as $12.50, delivered in the Pittsburgh district. The scrap lists of the Pennsylvania and Baltimore & Ohio railroads closed to-day and local dealers say they bid higher prices on the scrap offered than for some months. Dealers that have scrap in stock are inclined to hold it, and large lots are hard to obtain. There is a considerable short interest in the local market, and some recent short sales have been covered at higher prices by dealers. We note sales of 500 tons of low phosphorous melting steel at about $15.25; 300 tons of borings at $8.75 to $9; 1200 tons of No. 1 railroad wrought at $12.25; 2000 tons of heavy steel melting scrap at $12.25 and 1000 tons of selected heavy steel melting scrap at $12.50, all per gross ton, delivered to buyers' mills in the Pittsburgh district. Quotations are advanced on heavy steel scrap, borings and turnings and we can report the whole market as strong. Dealers are quoting about as follows per gross ton for delivery in the Pittsburgh and other districts.

Selected heavy steel scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery	$12.25 to $12.50
Compressed side and end sheet scrap	9.75 to 10.00
No. 1 foundry cast	10.75 to 11.00
No. 2 foundry cast	9.75 to 10.00
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	8.00 to 8.25
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	13.25 to 13.50
No. 1 railroad malleable stock	11.25 to 11.50
Grate bars	7.50 to 7.75
Low phosphorus melting stock	15.25 to 15.50
Iron car axles	24.25 to 24.75
Steel car axles	17.25 to 17.50
Locomotive axles, steel	20.75 to 21.25
Locomotive axles, iron	25.25 to 25.75
No. 1 busheling scrap	10.25 to 10.50
No. 2 busheling scrap	6.25 to 6.75
*Machine shop turnings	8.00 to 8.25
Old carwheels	11.75 to 12.00
*Cast-iron borings	8.75 to 9.00
†Sheet bar crop ends	12.50 to 12.75
Old iron rails	14.25 to 14.50
No. 1 railroad wrought scrap	13.50 to 13.75
Heavy steel axle turnings	9.00 to 9.25
Stove plate	7.50 to 7.75

*These prices are f.o.b. cars at consumers' mills in the Pittsburgh district.
†Shipping point.

Chicago

CHICAGO, ILL., February 4, 1914.—(*By Wire.*)

Cursory estimates of mill tonnage booked in January in this territory indicate an increase as compared with December of 40 to 60 per cent. The leading interest reports the orders booked in the last week of January as the largest week's business in seven months. Mills of less capacity, as for example, the leading independent mill in this territory, and jobbers who are booking mill orders have found the volume of business coming in on them such as to warrant a definite advance to minimum quotations of 1.20c., Pittsburgh, for bars and 1.25c. for shapes and universal mill plates, in order to conserve their second quarter capacity. For steel bars and sheared plates lower prices have not entirely disappeared. Projects requiring structural steel aggregating 25,000 tons are noted this week in the West. The steel for several thousand cars, including 5000 for the Union Pacific, has been placed with the mills. The railroads have to a considerable extent placed contracts for sheets and bars. The sheet market is now firmly settled on a higher basis. The movement of wire products originating in a substantial demand from users during January was large beyond expectations. Bar iron continues conspicuously weak. With this exception, the situation viewed from the standpoint of mill business and allowing for the absence of the railroads from the market has every appearance of real and notable improvement. To what extent this buying of steel from mill anticipates the needs of the user of steel is the question now being asked. February is likely to bring an answer. If the steel is going into consumption at a like rate, buying should continue as in January; otherwise not. The pig-

iron market shows some signs of subsiding interest, the feature of the week being the liberal purchase of ferromanganese by Western users on the basis of $35, seaboard. Foundry and malleable iron quotations show a little more firmness, and minimum quotations for standard grades are now approximating $14, f.o.b. furnace. The scrap market pursues its upward course.

Pig Iron.—The past week has witnessed the closing of a considerable tonnage but additional inquiry has fallen off from the activity of the earlier weeks of the month. The business now being figured is generally in lots of moderate size or is inquiry for the purpose of trying out the furnace position on last half delivery. To some foundries present quotations are a temptation to long future commitments. Since the recent quoting of prices at St. Louis on the basis of $13.50, Chicago, local producers have not found it desirable to shade $14 on the ordinary inquiries at hand, and one interest is now asking $14.25 at furnace. Southern furnaces are holding to their position and if anything are showing greater firmness, more iron being sold here last week at $10.75 and $11 than at $10.50. Some of the Northern furnaces making grades of high phosphorus iron which are competitive with Southern iron have been willing to take business at prices which figure back to $14 at furnace or $10.15, Birmingham. Imported ferromanganese sold freely in this market last week on the basis of $35, seaboard, which, on the basis of the present duty, is $1.25 above the lowest price previously recorded. The price has now reacted to $36 to $38. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace and do not include a local switching charge averaging 50c. a ton:

Lake Superior charcoal, Nos. 1, 2, 3, 4	$15.25 to $15.75
Northern coke foundry, No. 1	14.50 to 14.75
Northern coke foundry, No. 2	14.00 to 14.25
Northern coke foundry, No. 3	13.50 to 13.75
Southern coke No. 1 f'dry and 1 soft	15.10 to 15.60
Southern coke, No. 2 f'dry and 2 soft	14.60 to 15.10
Southern coke, No. 3	14.10 to 14.60
Southern coke, No. 4	13.60 to 14.10
Southern gray forge	13.60 to 14.10
Southern mottled	13.10 to 13.60
Malleable Bessemer	14.00 to 14.25
Standard Bessemer	17.65
Basic	13.50 to 14.00
Jackson Co. and Kentucky silvery, 6 per cent.	16.90
Jackson Co. and Kentucky silvery, 8 per cent.	17.90
Jackson Co. and Kentucky silvery, 10 per cent.	18.90

(*By Mail*)

Rails and Track Supplies.—The purchase of 35,000 tons of rails by a large Western railroad system, which has been intimated, has not yet been closed. Rail sales of importance, both for standard and girder sections, are still conspicuous by their absence. Purchases of spikes have been sufficiently heavy to add some firmness to their price, one Western mill announcing 1.55c. as its minimum. We quote standard railroad spikes at 1.50c. to 1.55c., base; track bolts with square nuts, 2.05c. to 2.10c., base, all in carload lots, Chicago; tie plates, $27 to $28 net ton; standard section Bessemer rails, Chicago, 1.25c., base; open hearth, 1.34c.; light rails, 25 to 45 lb., 1.25c.; 16 to 20 lb., 1.30c.; 12 lb., 1.35c.; 8 lb., 1.40c.; angle bars, 1.50c., Chicago.

Structural Material.—An increase in building projects is to be expected at this season but the work now coming up for figures is none the less gratifying and welcome. Fabricators whose shops, viewed at the most favorable angle, have perhaps two months of work ahead are sufficiently keen for the business offering as to make the next 60 days a period of decidedly low prices. In addition to the 15,000 tons of steel covered by contracts reported the past week, the Pike Building at Kansas City will call for 1500 tons; another building at Des Moines will require 1000 tons; the J. J. Hill Building at Minneapolis, to be used as a banking building and for the offices of the Minneapolis, St. Paul & Sault Ste. Marie, will take 3500 tons, and the Lumberman's Exchange Building at Chicago, requiring about the same amount of steel, will be up for figures. Recent contracts include 4500 tons of bridge steel for the Chicago & Northwestern, 6500 tons for the International smelter at Miami, Ariz., both placed with the American Bridge Company, which will also furnish 125 tons for the Duluth, Missabe & Northern. The Minneapolis Steel & Machinery Company will fabricate 2811 tons for the Merchants National Bank at St. Paul, and 915 tons for the Black Hawk Hotel at Rock Island will go to the Rock Island Bridge & Iron Works. A contract for 112 tons for the Hambach Building, Seattle, Wash., will be filled by the Hofius Steel & Equipment Company. The placing of the Union Pacific cars brought to the mills the past week a substantial tonnage of shapes, a large portion of which, for use in the Bettendorf underframes, will be furnished by the Bethlehem Steel Company. One of the Western mills, whose bookings of structural shapes as compared with its capacity during the first half have been relatively liberal, has advanced its minimum quotation for prompt shipment business to 1.25c., Pittsburgh basis. Added firmness also attaches to the quotation of 1.20c. remaining open. We quote for Chicago delivery from mill, 1.38c. to 1.43c.

For Chicago delivery from store we quote for structural shapes, 1.75c.

Plates.—A Western railroad which builds some of its cars in its own shops is in the market for a small tonnage of plates. The situation has not improved greatly, regarded from the standpoint of tonnage booked by the mills, and desirable offerings of such plates would not lack for takers at 1.15c., Pittsburgh. Universal mill plates share in the strength of shapes and are quotable at the same level. Heavy buying of pipe is responsible for the absorption of considerable of the universal mill capacity, especially at Pittsburgh and other Pennsylvania mills. For second quarter delivery some business has been booked, but whether or not at an advance over the prices quoted for first quarter is a question open to some doubt. For prompt shipment from mill, Chicago delivery, we quote 1.33c. to 1.38c.

For Chicago delivery of plates from store we quote 1.75c.

Bars.—With one mill in this market comfortably provided for on steel bars for the first half, and it quotations advanced to 1.20c., Pittsburgh basis, those buyers are fortunate in increasing degree who find themselves able to place their business at 1.15c. There is perhaps more reason for assurance as to the market strength with respect to bars than in other directions, and 1.30c. appears as the second quarter bid of some of the mills for business. Hard steel and twisted bars present a contrasted situation and price irregularities are noted with frequency. Neither is there any real improvement apparent in the bar-iron situation. Prices and tonnage are about as they were early in January, the market ranging from 1.10c. to 1.15c., most of the business going at the lower price. One local mill is still down and another that was idle for the first 12 days of January is now running about 50 per cent. of capacity. We quote for mill shipment as follows: Bar iron, 1.10c. to 1.15c.; soft steel bars, 1.33c.; hard steel bars, 1.30c.; shafting in carloads, 65 per cent. off; less than carloads, 60 per cent. off.

We quote store prices for Chicago delivery: Soft steel bars, 1.65c.; bar iron, 1.65c.; reinforcing bars, 1.65c. base, with 5c. extra for twisting in sizes ½ in. and over, and usual card extras for smaller sizes; shafting 57 per cent. off.

Sheets.—Local mills are quoting from three to four weeks' delivery on sheets and are having no difficulty in securing the full advance on the business now being offered. Except for such claims as buyers are making on the plea of protected tonnages at the old prices there is a general acceptance of the advance for new business. The railroads are understood to have made their sheet contracts just previous to the advance in price. We quote for Chicago delivery from mill: No. 10 blue annealed, 1.63c.; No. 28 black, 2.18c.; No. 28 galvanized, 3.18c.

For sheets out of store we quote for Chicago delivery as follows, minimum prices applying on bundles of 25 or more; No. 10 blue annealed, 1.95c.; No. 28 black, 2.45c. to 2.55c.; No. 28 galvanized, 3.50c. to 3.60c.

Rivets and Bolts.—The market has not changed to an appreciable extent, but the influence of increasing business on the part of fabricators and the generally better tone are making for progress in the direction of more regular quotations. Rather more liberal specifications for bolts than have been the routine for some time were reported for last week. We quote from mill as follows: Carriage bolts up to ⅞ x 6 in., rolled thread, 80-12½; cut thread, 80-5; larger sizes, 75-10; machine

bolts up to ⅝ x 4 in., rolled thread, 80-15; cut thread, 80-10; larger size, 75.15; coach screws, 80-15-10; hot pressed nuts, square head, $6.20 off per cwt.; hexagon, $7 off per cwt. Structural rivets, ½ to 1¼ in., 1.73c. to 1.78c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

Out of store we quote for structural rivets, 2.40c., and for boiler rivets, 2.60c. Machine bolts up to ⅝ x 4 in., 70-10-10; larger sizes, 70-12½; carriage bolts up to ⅝ x 6 in., 75-10; larger sizes, 70-12½ off. Hot pressed nuts, square head, $5.50, and hexagon, $6.20 off per cwt.

Wire Products.—The month of January witnessed a very heavy booking of wire and nails. One independent interest reports January as the largest month of its history. The announcement of an advance for wire nails to the basis of 1.60c. is therefore not entirely surprising. A corresponding advance in fabricated fencing is the common prediction. Reports from the country districts indicate a substantial demand on the retailers. We quote to jobbers as follows: Plain wire, No. 9 and coarser, base, $1.58; wire nails, $1.78; painted barb wire, $1.78; galvanized, $2.18; polished staples, $1.78; galvanized, $2.13, all Chicago.

Old Material.—The methods by virtue of whose workings the scrap market effervesces to higher price levels, under such circumstances as the present iron and steel market afford, are most remarkably contrived. How much of the advance that consumers are now paying for old material is entirely due to the stage business presented in the form of dealers' manipulations is difficult to say. A part of the advance certainly. More legitimate strength has been given to this market by purchases of steel scrap at St. Louis and by the demand for shoveling steel, borings and turnings from the East. Foundry scrap also has acquired a justly increased value, but represented by a part only of the advance being asked. But for rolling mill grades the demand has hardly increased from the minimum nor offers an attractive prospect. In this instance at least the higher quotations seem wholly artificial. The prices at which railroad offerings are being absorbed by the dealers are continually from 50c. to 75c. in advance of the market. Additional railroad lists include 4600 tons from the Chicago & Northwestern; 3400 tons from the Great Northern, which includes a lot of 2000 car wheels; 1000 tons from the Chicago & Alton, and 800 tons of car wheels from the Chicago & Eastern Illinois. The Pennsylvania also has a list of usual size. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

	Per Gross Ton	
Old iron rails	$13.00 to	$13.50
Old steel rails, rerolling	11.25 to	11.75
Old steel rails, less than 3 ft	10.50 to	11.00
Relaying rails, standard section, subject to inspection		24.00
Old carwheels	12.25 to	12.50
Heavy melting steel scrap	10.25 to	10.75
Frogs, switches and guards, cut apart	10.25 to	10.75
Shoveling steel	9.00 to	9.50
Steel axle turnings	6.75 to	7.25
	Per Net Ton	
Iron angles and splice bars	$12.75 to	$13.25
Iron arch bars and transoms	12.75 to	13.25
Steel angle bars	9.00 to	9.50
Iron car axles	17.50 to	18.00
Steel car axles	13.25 to	13.75
No. 1 railroad wrought	9.25 to	9.75
No. 2 railroad wrought	8.75 to	9.25
Cut forge	8.75 to	9.25
Steel knuckles and couplers	9.50 to	10.00
Steel springs	10.00 to	10.50
Locomotive tires, smooth	10.75 to	11.25
Machine shop turnings	5.25 to	5.75
Cast borings	5.25 to	5.75
No. 1 busheling	8.25 to	8.50
No. 2 busheling	6.75 to	7.25
No. 1 boilers, cut to sheets and rings	6.00 to	6.50
Boiler punchings	9.50 to	10.00
No. 1 cast scrap	10.75 to	11.25
Stove plate and light cast scrap	10.00 to	10.50
Grate bars	9.50 to	10.00
Railroad malleable	10.00 to	10.50
Agricultural malleable	8.75 to	9.25
Pipes and flues	7.50 to	7.75

Cast-Iron Pipe.—The receiving of bids for pipe at Milwaukee on 700 tons and at Portland, Ore., on a minimum of 5200 tons resulted in an award to the United States Cast Iron Pipe & Foundry Company. Other lettings scheduled for last week have not yet resulted in the placing of the pipe with the makers. We quote as follows, per net ton, Chicago: Water pipe, 4 in., $27; 6 to 12 in., $25; 16 in. and up, $24, with $1 extra for gas pipe.

The Northwestern Iron & Metal Company, Kenosha, Wis., has been organized with $10,000 capital stock to do a general scrap business. J. D. Rosenblum and Nathan and Benjamin Silver are the principal stockholders. The company is successor to the concern of the same name operated by the late Max Rosenblum.

Philadelphia

PHILADELPHIA, PA., February 3, 1914.

Greater firmness is now in evidence in practically all lines. Advances are still more or less irregular, being based usually on conditions confronting individual sellers. At the same time the disposition to sell for forward account appears to be steadily growing smaller. A fair movement in pig iron, at slightly better prices, is noted. There has been a larger volume of business in finished materials and mills are operating on a slightly better basis. Fluctuations in prices of ferromanganese have been a feature of the week, low quotations resulting in heavy buying. Coke continues quiet. Old material is stronger, higher prices being realized for some grades.

Iron Ore.—The current movement in new business is along extremely narrow lines. Importations last week were confined to a cargo of 5100 tons of Cuban ore.

Pig Iron.—Scattered advances have resulted in a stronger market, with the result that there has been considerable quiet buying by melters who have held off waiting for the bottom. In many cases small buyers have taken additional tonnages for near future delivery and have frequently paid advances of 25c. or more. Standard brands of eastern Pennsylvania No. 2 X foundry are no longer available at $14.50, delivered in this district, and few producers are willing to accept business at $14.75, several holding at $15 to $15.25 and in extreme cases $15.50. Some sales are being made at the higher prices named. While certain melters would purchase for second quarter and even more extended shipment, few furnaces are willing to sell extensively for delivery beyond the first quarter. The bulk of the buying has been in lots ranging from carloads to a few hundred tons. An inquiry for 500 tons of coke malleable, for February delivery, recently before the trade, is reported closed at $15 to $15.25, delivered. Cast-iron pipe makers are still in the market for odd lots of off grade iron, small sales being made around $14, delivered. An inquiry for 2000 tons by a Delaware River melter is reported unclosed. Virginia foundry iron has been moving somewhat more freely in this market. Sales range from carloads to 500 tons for deliveries for prompt to first half. Price irregularity does not appear to be entirely eliminated, although the principal makers hold pretty firmly at $12.75 at furnace, for No. 2 X, equal to a minimum of $15.55, delivered in this vicinity. Some furnaces refuse to allow the usual differential of 25c. for lower grades, but this is not general. Rolling mill forge is openly reported quiet, although it is understood that negotiations are under way for a block of about 6000 tons for delivery over the next three months. Steel making irons have not been particularly active. Eastern basic consumers are said, in view of better buying in finished material, to be showing some interest in the market, while an Eastern buyer for Western account has an inquiry out for 1500 tons of third quarter basic. The movement in low phosphorus has been light, although a fair volume of inquiry is pending. Pig-iron makers generally take a more optimistic view of the market. Order books are in better shape and deliveries on contracts are, as a rule, being taken freely by consumers. The following range of prices about represents the market for standard brands of pig iron, delivered in buyers' yards in this vicinity, for the first quarter and, in instances, the first half of the year.

Eastern Penna. No. 2 X foundry	$14.75 to	$15.25
Eastern Pennsylvania No. 2 plain	14.50 to	14.75
Virginia No. 2 X foundry	15.55 to	16.00
Virginia No. 2 plain	15.30 to	15.50
Gray forge	14.00 to	14.25
Basic		14.00
Standard low phosphorus	21.00 to	21.25

Ferroalloys.—The ferromanganese market has been excited by further reductions in prices, particularly on foreign material. The announced reduction to $40, seaboard, was rapidly followed by concessions and sales in this country are estimated to have been made covering from 25,000 to 30,000 tons at prices ranging from $35 to $38, seaboard, some little of which covered deliveries over two years. On Monday, foreign makers generally withdrew quotations, but cable advices today fix asking prices at $38, seaboard, and orders are largely subject to cable confirmation. It is estimated that fully 5000 tons, for varying delivery, has recently been sold in this district. Little information as to the action of the domestic maker in this movement has been available. In some instances sellers obtained $1 advance over first half for second half delivery. Ferrosilicon has been comparatively quiet. Importations of ferromanganese last week aggregated 290 tons.

Billets.—The situation shows little change, although makers are inclined to be firmer on prices. New business has been light. Occasional reports of contract renewals make up the bulk of the forward business. Mill operations show little change, no gains in the productive rate being reported. Makers are disposed to hold more firmly to $22.40, delivered here, for basic open-hearth rolling billets, although the market has not been tested with any sizeable business. Current small sales are on that basis. Forging billets command an advance of $4 to $5 a ton over rolling billets, according to specification.

Plates.—Eastern mills are receiving a fair volume of new business, but experience difficulty in lifting prices to a higher level. One Eastern mill operated at 80 per cent. capacity last week and took orders at a still better basis. Contracts are still being entered for delivery over various portions of the first half of the year, those for extended shipment usually being at 1.40c. here while for early shipment 1.35c. rules. Definite orders for plates for ship work, which were authorized some time ago, involving 7000 tons of hull plates to a Western and 1000 tons of boiler plates to an Eastern mill, have been placed. Bids are going in on some 8000 tons of plates for Government vessels. A small tonnage of plates will be required to cover the Pennsylvania Railroad's recent programme for locomotives and cars, to be built at its Juniata shops.

Structural Material.—Current miscellaneous business in plain shapes is reported to have been in slightly better volume, but mill activities have not materially changed. An Eastern independent mill is reported the low bidder on 2700 tons of bridge work in New England, while 1000 tons of building work in Baltimore went to a local fabricator. Very little building work covering a large tonnage of fabricated material has come out in this immediate district, although some small bridge work is pending. Prices of plain material are somewhat firmer, ranging from 1.35c. to 1.40c. delivered in this district, according to quantity and delivery.

Sheets.—Business has been in fair volume. Few producers are willing to sell for extended delivery, although consumers are showing more desire to contract. Mill activities continue on a fairly even basis, although not covered for any extended period. Prices are generally firmer and in but few instances are No. 10 blue annealed sheets available at less than 1.60c. delivered here, although on tonnage orders 1.55c. might still be done.

Bars.—A larger volume of inquiry has developed. The tonnage coming to iron bar makers has been larger and order books are in much better shape. Good moderate buying of steel bars is reported. Mills show less disposition to shade prices for iron bars, ordinary grades being held at 1.22½c. to 1.27½c. delivered here, with the better grades commanding up to 1.32½c. Steel bars are quoted at 1.35c. to 1.40c. here, according to quantity and delivery.

Coke.—The market remains quiet. Sales in furnace grades have not been active, confined mostly to prompt lots at practically unchanged prices. Foundry coke has been comparatively dull, small sales going at $2.75 to $3 at oven. The following range of prices, per net ton, is named for delivery in buyers' yards in this vicinity:

Connellsville furnace coke	$3.90 to $4.40
Connellsville foundry coke	4.80 to 5.15
Mountain furnace coke	3.60 to 4.10
Mountain foundry coke	4.50 to 4.85

Old Material.—While mills show little interest in heavy melting steel, dealers are aggressive in making purchases and have offered more than $11.50 delivered on some of the railroad lists. Practically all the business moving is between dealers, who are holding steel for $12. In other grades a better small lot movement is reported, with each successive sale usually bringing an advance in price. Mills have offered higher than recent quotations for wrought scrap, old iron axles and rails, stove plate and grates, and in some classes of material good purchases have been made. Railroad offerings this month are, as a rule, smaller than usual. Cast-iron pipe makers have been purchasers of machinery cast. The following quotations about represent the market for deliveries in buyers' yards in this district, covering eastern Pennsylvania and taking freight rate varying from 35c. to $1.35 per gross ton:

No. 1 heavy melting steel	$11.00 to $11.50
Old steel rails, rerolling	12.50 to 13.00
Low phosphorus heavy melting steel scrap (nominal)	14.50 to 15.00
Old steel axles	16.00 to 16.50
Old iron axles	23.00 to 24.00
Old iron rails	16.50 to 17.00
Old carwheels	12.50 to 13.00
No. 1 railroad wrought	14.00 to 14.50
Wrought-iron pipe	11.00 to 11.50
No. 1 forge fire	8.75 to 9.00
Bundled sheets	8.75 to 9.00
No. 2 light iron (nominal)	5.00
No. busheling (nominal	8.00 to 8.50
Wrought turnings	8.50 to 9.00
Cast borings	8.75 to 9.00
Machinery cast	12.50 to 13.00
Grate bars, railroad	9.50 to 10.00
Stove plate	10.00 to 10.50
Railroad malleable	10.00 to 10.50

Cleveland

CLEVELAND, OHIO, February 3, 1914.

Iron Ore.—While shipping orders are better than a month ago, dock shipments continue light. Prices are not yet being considered. Indications are that the buying movement will not start up before April. There has recently been considerable chartering of vessel tonnage for coal shipments to Lake Superior ports at the 30c. rate, which has prevailed several years. We quote 1913 prices as follows: Old range Bessemer, $4.40; Mesaba Bessemer, $4.15; old range non-Bessemer, $3.50; Mesaba non-Bessemer, $3.40.

Pig Iron.—A fair volume of business is coming out in foundry grades, but the market is not so active as a few weeks ago. The sales of the past few days have been almost all in rather small lots, the larger buyers having previously covered for their requirements. As conditions in the foundry trade are not improving very much, melters generally are following a conservative policy of not buying more iron than they are sure they will need. Many have still some iron left that was purchased for the last quarter delivery and these have been slow about buying additional iron. However, they feel that prices will be no lower and some who have been hesitating are now coming into the market to protect themselves against a possible advance. The local market is firm at $13, Cleveland, for No. 2 for outside shipment. In the Valley some foundry iron has recently been offered as low as $12.65, but it is believed that $12.75 is now the minimum quotation and most producers are holding at $13. One or two furnace interests are asking an advance of 25c. a ton over prices at which they have recently booked orders. Southern iron is quiet with prices ranging from $10.50 to $11, Birmingham, for No. 2. Ohio silvery iron which has been active has quieted. We quote, f.o.b. Cleveland, as follows:

Bessemer	$14.90
Basic	13.00
Northern No. 2 foundry	13.50
Southern No. 2 foundry	$14.85 to 15.35
Gray forge	13.00
Jackson County silvery 8 per cent. silicon	$17.30 to 17.55

Coke.—The market is quiet. Prices on the best grades of furnace coke are firm at $1.95 to $2 per net ton at oven for prompt shipment and contract. Standard 72-hr. foundry coke is quoted at $2.50 to $2.75 per net ton. Several of the better grades are being sold at $2.65.

Finished Iron and Steel.—Demand is holding up well and there has been a considerable stiffening in prices. The leading interest announced Monday an advance in prices to 1.25c. Pittsburgh on steel bars, plates and shapes for prompt shipment. Some of the independent mills are likely to make a similar advance. Steel bar sales were being made until February 1 at 1.15c. for prompt shipment, but it is believed that this price has now disappeared. For the second quarter 1.25c. is the general quotation. Plates and structural material are quoted at 1.20c. to 1.25c. for the first quarter, 1.30c. being the ruling quotation for the second quarter. However, some prompt shipment plates can probably still be had from the smaller mills at 1.15c. With the approach of spring there is considerable inquiry for contracts for steel bars for reinforcing purposes. Makers of hard steel bars are holding prices at 1.15c. to 1.20c. There is little activity in the bar iron market, but prices are firm with 1.20c. Cleveland, as a minimum quotation. The approach of spring is having the effect of stimulating activity in structural lines and considerable small building work is being figured on. The only new work of any size for which bids will be received this week is a building for the Diebolt Brewing Company, Cleveland, which will require 800 tons. Sheet business has quieted since the advance in prices. Most consumers are now believed to be under contract, but there has not been sufficient business to go round and some of the mills are far from filled up with orders. As a result prices are not firm. Contracts for delivery until July 1 are being made at 1.90c. to 2c. for No. 28 black and 2.90c. to 3c. for No. 28 galvanized. For early delivery black sheets can still be had in round lots at 1.85c. The leading producer has advanced prices on wire products $1 a ton to $1.60 for nails and various independent makers have followed with a similar advance. Rivets are firm at the recent advance to 1.60c. for structural and 1.70c. for boiler rivets. Warehouse business shows more improvement. Stock prices are unchanged at 1.80c. for steel bars and 1.90c. for plates and structural material.

Old Material.—Some prices have been further advanced and the market is very firm. Very few sales are being made, however, as producers and consumers have so far been unable to get together on prices. Producers generally are holding their material for a further advance in prices. Considerable activity is expected as soon as the deadlock over prices disappears. Iron car axles have been put up $2 a ton and a further advance of 25c. a ton is noted in borings and turnings. We quote f.o.b. Cleveland as follows:

Per Gross Ton

Old steel rails, rerolling	$12.00 to $12.50
Old iron rails	12.50 to 13.00
Steel car axles	16.50 to 17.00
Heavy melting steel	10.00 to 10.50
Old carwheels	11.50 to 12.00
Relaying rails, 50 lb. and over	23.00 to 25.00
Agricultural malleable	9.00 to 9.50
Railroad malleable	11.00 to 11.25
Light bundled sheet scrap	7.00 to 7.50
Bundled tin scrap	11.00 to 11.50

Per Net Ton

Iron car axles	$20.00 to $21.00
Cast borings	6.25 to 6.50
Iron and steel turnings and drillings	5.75 to 6.00
Steel axle turnings	6.00 to 6.25
No. 1 busheling, new	8.75 to 9.00
No. 1 busheling, old	8.50 to 8.75
No. 1 railroad wrought	11.00 to 11.25
No. 1 cast	10.50 to 11.00
Stove plate	8.00 to 8.50

Boston

BOSTON, MASS., February 3, 1914.

Old Material.—The tendency of prices is still upward, and the coming fortnight is expected to bring an even greater stiffening. Brokers are in some cases paying rather more than the prevailing rates of the contracts with the mills, but this is rather more speculative than an actual line on the market. Material continues to come slowly, the general inclination being to hold for better prices. The quotations given below are based on prices offered by the large dealers to the producers and to the small dealers and collectors, per gross ton, carload lots, f.o.b. Boston and other New England points which take Boston rates from eastern Pennsylvania points. In comparison with Philadelphia prices the differential for freight of $2.30 a ton is included. Mill prices are approximately 50c. a ton more than dealers' prices:

Heavy melting steel	$8.00 to $8.25
Low phosphorus steel	13.75 to 14.75
Old steel axles	13.25 to 13.75
Old iron axles	21.25 to 21.75
Mixed shafting	12.25 to 12.50
No. 1 wrought and soft steel	9.00 to 9.25
Skeleton (bundled)	6.00 to 6.50
Wrought iron pipe	7.25 to 7.75
Cotton ties (bundled)	6.75 to 7.25
No. 2 light	3.75 to 4.25
Wrought turnings	4.50 to 5.00
Cast borings	5.50 to 6.00
Machinery, cast	11.25 to 11.50
Malleable	8.00 to 8.25
Stove plate	7.75 to 8.00
Grate bars	6.25 to 6.50
Cast-iron carwheels	11.00 to 11.25

Cincinnati

CINCINNATI, OHIO, February 4, 1914.—(*By Wire.*)

Pig Iron.—It is now understood that a larger tonnage of foundry and basic iron was contracted for in January than previously estimated. Many melters took advantage of the low prices prevailing, and in some cases enough iron was bought to run through the third quarter. It is stated that slight concessions were made on both Northern and Southern iron, that in a measure may account for the comparatively heavy but quiet buying in the past 30 days. Prices have stiffened somewhat in the last few days although the inquiry is light. Nothing better than $10.50, Birmingham, can be done in this market on Southern No. 2 foundry, and $13, Ironton, is minimum for either prompt or first half shipment. A few sales of Southern iron have been made at 50c. above the quotation given above, and one maker has advanced quotations to $11.50 for either second or third quarter. Considerable quiet interest is manifested in third and fourth quarter prices and there has been some contracting for that delivery but no tonnages of note have changed hands. For first half shipment two 500-ton lots of Southern iron were taken by central Indiana consumers. A mixed lot of 1400 tons of Northern and Southern foundry was bought by a central Ohio company for second quarter delivery. A central Indiana firm also ordered 1200 tons of Northern iron for the same shipment. Few inquiries are out in this territory but melters in the Chicago and St. Louis districts are negotiating for both first and last half requirements. There is no open interest taken in malleable. Some ferromanganese has been bought in this territory, and today's quotations are $36, seaboard, for prompt shipment and $1 a ton higher for second quarter movement. Based on freight rates of $3.25 from Birmingham and $1.20 from Ironton we quote, f.o.b. Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft.	$14.25 to $14.75
Southern coke, No. 2 f'dry and 2 soft.	13.75 to 14.25
Southern coke, No. 3 foundry	13.25 to 13.75
Southern, No. 4 foundry	12.75 to 13.25
Southern gray forge	12.25 to 12.75
Ohio silvery, 8 per cent. silicon	17.20 to 17.70
Southern Ohio coke, No. 1	15.20 to 15.70
Southern Ohio coke, No. 2	14.20 to 14.70
Southern Ohio coke, No. 3	13.95 to 14.20
Southern Ohio malleable Bessemer	14.20 to 14.70
Basic, Northern	14.20 to 14.70
Lake Superior charcoal	16.25 to 17.25
Standard Southern carwheel	27.25 to 27.75

(*By Mail*)

Coke.—A comparatively limited quantity of furnace coke is still to be bought in this immediate territory. At least one interest will have to provide for a supply to carry it through the next few months. The demand for domestic coke is not as good as it was in January. A considerable tonnage of foundry coke is being sold in lots of one to ten cars, mostly for immediate shipment. Specifications on contracts previously made are said to be satisfactory. Prices are unchanged, Con-

nellsville furnace grades being quoted at $1.90 per net ton at oven for prompt shipment and around $2 on contracts. Foundry coke in that district ranges from $2.40 to $2.75, the lower price representing the prompt shipment price on only a limited number of brands. Both Wise County and Pocahontas operators are holding out for an advance of about 15c. a ton over the above quotations.

Finished Material.—Specifications for both black and galvanized sheets are reported very satisfactory to the mills in this territory. No contracts are accepted for delivery beyond April 1, and the prompt shipment business is said to be better than the makers expected 30 days ago. Prices continue to grow firmer. No. 28 black sheets are quoted, in desirable tonnages, at 2.15c. to 2.20c., and galvanized at 3.15c. to 3.20c., f.o.b. cars Cincinnati, or Newport, Ky. Steel bars are obtainable from warehouse stocks at 1.75c. to 1.80c. and structural shapes and plates at 1.85c. to 1.90c. The railroads in this territory are not heavy purchasers of track material of any kind.

Old Material.—The situation is improving. While the quotations named below represent an advance of approximately 25c. a ton on all grades, it is possible that the selling prices given, in a few instances, are below the market. There is a much better demand for scrap iron from different sources, and this doubtless has brought about an improvement in prices in the face of a comparatively low schedule for pig iron. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices f.o.b. at yards:

Per Gross Ton

Bundled sheet scrap	$6.75 to	$7.25
Old iron rails	11.00 to	11.50
Relaying rails, 50 lb. and up	19.75 to	20.25
Rerolling steel rails	11.00 to	11.50
Melting steel rails	9.25 to	9.75
Old carwheels	10.25 to	10.75

Per Net Ton

No. 1 railroad wrought	$8.75 to	$9.25
Cast borings	4.50 to	5.00
Steel turnings	4.50 to	5.00
No. 1 cast scrap	9.25 to	10.00
Burnt scrap	6.00 to	6.50
Old iron axles	16.00 to	16.50
Locomotive tires (smooth inside)	10.00 to	10.50
Pipes and flues	5.75 to	6.25
Malleable and steel scrap	7.00 to	7.50
Railroad tank and sheet scrap	4.50 to	5.25

Birmingham

BIRMINGHAM, ALA., February 2, 1914.

Cast-Iron Pipe.—The local plants are working full time. The leading interest is reported as having a 16,000-ton order from the city of Chicago as well as one for 9000 tons from another Western city. Prices are reported as fairly well maintained. The situation is better than in some time and is expected to continue to improve. The new plant of the Lynchburg Pipe Company at Anniston has commenced operations. We quote, per net ton, f.o.b. works, as follows: 4-in., $22; 6-in. and upward, $20, with $1 added for gas pipe.

Pig Iron.—For the first time in many months $11.50 was paid for No. 2 foundry iron for delivery in the second half. It was for a small lot and the first order received by the selling company since its recent advance to this level was made. This concern has sold 30,000 tons in two months on a two-stack operation and is already scarce of some grades. Brokers admit that small lots recently purchased have been on the $11 basis, with some fetching as much as $11.25. On the other hand, a large interest reports failure to secure customers on an offer of $11 for any tonnage desired. While it is true that immense sales of Birmingham district pig iron were made in January, these sales were mostly to pipe companies, steel foundries and other large consumers. Well-informed iron men assert that the small consumers have held back in a way that does not demonstrate a return to activity in small plants. The general quotation now is $11, with one interest holding at $11.50 for second quarter. For large tonnages $10.75 might still be done, but it seems reasonably certain that the average buyer of Birmingham iron must now pay $11. If the metal is at all special the price will be higher. Offers of $10.50 involving large lots have been turned down by more than one interest since the big buying took place. The major portion of the business done the past week was on the $11 basis and makers seem in unison on that score. The make will soon be increased by the blowing in of the Woodward Iron Company's new furnace. We quote, per gross ton, f.o.b. Birmingham district furnaces, as follows:

No. 1 foundry and soft	$11.25 to	$11.75
No. 2 foundry and soft	10.75 to	11.25
No. 3 foundry	10.25 to	10.75
No. 4 foundry	10.00 to	10.50
Gray forge	9.75 to	10.25
Basic	10.50 to	11.00
Charcoal	24.00 to	24.50

Coal and Coke.—The coal trade has not improved. The domestic mines are in a number of instances selling their output on the steam coal basis owing to carried-over stocks, and prices have suffered in consequence. The demand for coke is not up to a satisfactory standpoint, owing to checking of operations at some depots of consumption. We quote, per net ton, f.o.b. oven, as follows: Furnace coke, $2.50 to $2.75; foundry, $3.25 to $3.75.

Old Material.—A fair business is reported by dealers, and they are also confident of its continuance, owing to increased operations at steel mills. There is a good demand for steel scrap, which has been quite active. We quote, per gross ton, f.o.b. dealers' yards, as follows:

Old iron axles (small)	$15.00 to	$15.50
Old steel axles (light)	15.00 to	15.50
Old iron rails	12.50 to	13.50
No. 1 railroad wrought	12.00 to	12.50
No. 2 railroad wrought	10.00 to	10.50
No. 1 country wrought	9.50 to	10.00
No. 2 machinery cast	10.50 to	11.00
No. 1 steel scrap	10.50 to	11.00
Tram carwheels	10.50 to	11.00
Standard carwheels	12.00 to	12.50
Light cast and stove plates	9.00 to	9.50

St. Louis

ST. LOUIS, MO., February 2, 1914.

Heavier buying of pig iron, increased takings of finished material and added activity in old material are the features of the market.

Pig Iron.—Buying in large lots has continued and the interesting feature has been the promptness with which transactions have been closed, few inquiries remaining. Representatives are beginning to report instructions to move prices up 25 cents and in one or two cases 50 cents, particularly with Southern iron. However, most of the furnaces are still accepting contracts for the first half on the $10.50 basis, Birmingham, for No. 2 Southern foundry. Transactions include three of 1000 tons each of No. 2 Southern, two of 500 tons of No. 2 Southern and one of 450 tons and also one of 500 tons analysis iron approximating No. 3 Southern. In Northern iron there were sales of 7000 tons and 3000 tons of basic, 2000 tons of Northern coke carwheel iron, 4000 tons of malleable, 500 tons of Ohio No. 2, 500 tons of Northern carwheel iron and several of smaller size. Inquiries pending at the close of the week were for 1000 tons of Bessemer ferrosilicon, 800 tons of ferromanganese, 400 tons of ferrosilicon and 2000 tons of malleable. A feature has been the renewed disposition of railway supply interests to buy in increasing quantity. A survey of the month develop total sales for St. Louis and immediate territory delivery of very close to 125,000, which means that the requirements have been pretty well covered for the first half of 1914.

Coke.—An inquiry for 13,000 tons of 48-hr. coke is under consideration. By-product coke is beginning to interest the market as a result of the Laclede Gas Company's new capacity to supply it, but no very large deals have been reported.

Finished Iron and Steel.—Transactions for January have shown an increase of approximately 50 per cent. and maintain the increased pace which has been set since the new year began. Fabricating shops are busier

than they have been, but for the most part on small work, though larger work is beginning to come into evidence with the passing of the winter.

Old Material.—Dealers are reported to be covering their contracts and this has had a tendency to stiffen the prices of scrap, apart from the generally better feeling which has gained momentum. The steel mills are re-entering the market to a considerable extent, but as yet have not been particularly successful in getting together with the dealers on actual transactions. Inquiries are becoming more numerous and more definite as to needs and generally the market sentiment is vastly improved. Relaying rails are still in excellent demand, with the supply continuing limited. The only list out is one of 1700 tons from the Missouri Pacific. Others follow soon. We quote dealers' prices f.o.b. St. Louis as follows:

Per Gross Ton

Old iron rails	$12.00 to $12.25
Old steel rails, re-rolling	11.75 to 12.00
Old steel rails, less than 3 feet	11.00 to 11.25
Relaying rails, standard section, subject to inspection	23.00 to 24.00
Old carwheels	11.25 to 11.75
No. 1 railroad heavy melting steel scrap	10.50 to 11.00
Shoveling steel	9.00 to 9.50
Frogs, switches and guards cut apart	10.50 to 11.00
Bundled sheet scrap	5.50 to 6.00

Per Net Ton

Iron angle bars	$10.50 to $11.00
Steel angle bars	9.00 to 9.50
Iron car axles	17.50 to 18.00
Steel car axles	13.00 to 13.50
Wrought arch bars and transoms	12.50 to 12.75
No. 1 railroad wrought	9.00 to 9.50
No. 2 railroad wrought	8.50 to 9.00
Railroad springs	9.50 to 10.00
Steel couplers and knuckles	9.50 to 10.00
Locomotive tires, 42 in. and over, smooth	10.00 to 10.50
No. 1 dealers' forge	7.75 to 8.25
Mixed borings	3.75 to 4.25
No. 1 busheling	8.00 to 8.25
No. 1 boilers, cut to sheets and rings	6.00 to 6.50
No. 1 cast scrap	9.25 to 9.75
Stove plate and light cast scrap	8.50 to 9.00
Railroad malleable	8.50 to 9.00
Agricultural malleable	8.00 to 8.25
Pipes and flues	6.00 to 6.50
Railroad sheet and tank scrap	6.00 to 6.50
Railroad grate bars	8.00 to 8.25
Machine shop turnings	5.00 to 5.25

Buffalo

BUFFALO, N. Y., February 3, 1914.

Pig Iron.—The closing week of January showed a fair volume of business placed aggregating about 15,000 tons, principally of foundry grades. Several inquiries for large tonnages are still before the market. One of the local foundries has booked orders in the latter part of January sufficient to keep its plant in full operation for the remainder of the year, if the contracts entered into are specified against fully. There are indications of a gradual firming of prices. We quote as follows, f.o.b. furnace, for first quarter delivery:

No. 1 foundry	$13.25 to $13.50
No. 2 X foundry	13.00 to 13.25
No. 2 plain	13.00
No. 3 foundry	12.75 to 13.00
Gray forge	12.50 to 12.75
Malleable	13.00 to 13.50
Basic	13.50 to 14.00
Charcoal	15.50 to 16.50
Charcoal, special brands and analysis	17.00 to 19.50

Finished Iron and Steel.—A number of agencies state that actual orders placed in January was for a larger volume than for any month of the last half of last year, with much larger shipments than for the month of December. Prices are firm, with advancing tendencies. Two of the leading interests have withdrawn all outstanding quotations and are now asking 1.25c., base, Pittsburgh, for bars, shapes and plates for first quarter delivery, with 1.30c. asked for contracts for the second quarter. Wire prices were also advanced to $1.40, base, for wire and $1.60, base, for nails, Pittsburgh. Some of the tin plate mills are declining to quote on further business at this time, preferring to wait until later, to take advantage of the higher prices which seem inevitable. Wrought steel pipe has advanced $1 per ton. The American Radiator Company has taken bids on 150 tons of steel for a foundry addition to be made to its Pierce plant in Buffalo. The American Bridge Company has taken 100 tons for a school for the Church of the Holy Name, Buffalo, and the George Kellogg Structural Company, this city, has 175 tons for a high school building, Depew, N. Y.

Old Material.—The week has shown a good volume of business in nearly all lines and at increased prices for many commodities. Sales of about 1000 tons of old car wheels are reported at approximately $12 per ton, f.o.b. Buffalo. Heavy melting steel is in good demand and $11 per gross ton is the maximum obtained, the prevailing price for the past two weeks. We quote as follows per gross ton f.o.b. Buffalo:

Heavy melting steel	$10.25 to $11.00
Bundled sheet scrap	6.25 to 6.75
No. 1 busheling scrap	9.25 to 9.75
No. 2 busheling scrap	6.50 to 7.00
Low phosphorus steel scrap	15.50 to 16.25
Iron rails	15.00 to 15.50
No. 1 railroad wrought	12.00 to 12.50
No. 1 railroad and machinery cast scrap	12.00 to 12.50
Steel axles	17.00 to 17.50
Iron axles	22.50 to 23.00
Carwheels	11.50 to 12.00
Railroad malleable	10.50 to 11.00
Locomotive grate bars	9.50 to 10.00
Wrought pipe	8.50 to 9.00
Machine shop turnings	5.50 to 6.00
Heavy steel axle turnings	8.25 to 9.00
Clean cast borings	6.25 to 6.75
Stove plate (net ton)	9.75 to 10.00
Bundled tin scrap	12.00

New York

NEW YORK, February 4, 1914.

Pig Iron.—One or two contracts have interested the Eastern pig iron market in the past week, but otherwise the market has not shown any significant activity. There is no well-defined current. Here and there an inclination appears on the part of furnaces to get out of the deep rut into which prices have fallen, and there is varying success in the effort. It is at least true that the low prices are not so common. Buffalo producers, who went down to $12 for No. 2 X in the early part of January and late December, are firmer in their views than was the case two weeks ago. Some of them ask $12.75 at furnace and in other cases $13 has been realized, though these prices do not apply to round lots. It is still possible to buy at $12.50. A New England manufacturer of textile machinery is reported to have bought about 4000 tons for shipment in February and the four months following, for the most part at $12.50, Buffalo, for No. 2 X. A large pump company is in the market for iron for the rest of the year. Its immediate inquiry is for about 900 tons for a Buffalo plant, but other inquiries indicate that it would buy 15,000 to 20,000 tons for shipment in the second, third and fourth quarters. In New Jersey purchases of the past week have amounted to about 2000 tons, including two lots of 500 tons. Foundry operations improve but slowly. On the whole, the indications given by shipping directions on pig iron contracts are rather more favorable. Eastern Pennsylvania furnaces have been able to close a better proportion of recent New Jersey business than they were getting a few weeks ago, when low-priced Buffalo iron was cutting so much of a figure in eastern districts. We quote Northern iron for tidewater delivery as follows: No. 1 foundry, $14.75 to $15; No. 2 X, $14.50 to $14.75; No. 2 plain, $14 to $14.25. Southern iron is quoted at $15 to $15.25 for No. 1 and $14.75 to $15 for No. 2.

Finished Iron and Steel.—The Carnegie Steel Company has announced an increase on bars to 1.25c., Pittsburgh, and, while this price is by no means yet ruling, it is taken to mean that there will be an absolute disappearance of 1.15c. business. Another company has raised its prices on nuts $2 and $3 a ton and on bolts 5 to 7½ per cent. Another company booked actual orders through January for an amount aggregating 10 per cent. over its maximum capacity for that month. Some more railroad car business has materialized, and, while the increasing signs of activity in this field are thought due mainly to actual need for cars, irrespective of the decision being waited for, regarding freight rate increases, there is a feeling that the railroads fear to delay purchasing too long with the more favorable attitude in financial quarters and the present low mar-

ket. Sellers all report good bookings, and in bars, for example, deliveries in less than two weeks are not commonly promised, though plates, owing partly to the long time leanness of railroad car buying, are still easy, with the volume moving, however, sufficient to keep one Eastern mill at least at about 75 per cent. capacity. Low prices for fabrication still ruling indicate that fabricating capacity has not at all been reached, and, while there has been some stiffening, no marked improvement is expected until considerable additional work is put under contract. The purchases of railroad cars include 3000 for the Chesapeake & Ohio, 1000 each to the American Car & Foundry Company (gondolas for the Hocking Valley), the Standard Steel Car Company and the Pressed Steel Car Company; 500 for the Union Tank Line, to the American Car & Foundry Company, and 1000 gondolas for the Illinois Central, to the American Car & Foundry Company. The Pennsylvania Railroad is to build 1000 box cars with steel underframes, 50 passenger cars and some 30 locomotives at its Altoona shops. The Southern Railroad is about to come into the market for 3500 freight cars and 50 passenger cars. In fabricated structures the Hay Foundry & Iron Works has taken 1600 tons for a public market in Newark; the American Bridge Company, 850 tons for a department store in New Haven; Lewis F. Shoemaker & Co., 1000 tons for the Davison Chemical Company, Baltimore, and the Levering & Garrigues Company, 350 tons for the Elks' Club, Providence. The Phoenix Bridge Company is expected to get 2700 tons in bridges for Springfield, Mass., being the lowest bidder. We quote mill shipments of steel bars, plates and structural material at 1.20c. to 1.25c., Pittsburgh, or 1.36c. to 1.41c., New York; iron bars, 1.25c. to 1.35c., New York, although one interest has advanced to 1.40c., New York. We quote iron and steel bars from store, 1.90c. to 1.95c., and shapes and plates, 1.95c. to 2c.

Cast-Iron Pipe.—The city of Worcester, Mass., will open bids on 3200 tons February 9. The Warren Foundry & Machine Company was the successful bidder for 1200 tons placed by New Bedford, Mass., and 450 tons by Garfield, N. J. Manufacturers report the private demand excellent, being better than for a long time. Prices are stiffening, but carload lots of 6 in. are still to be obtained at $22 to $23 per net ton, tidewater.

Old Material.—While considerable activity prevails in the market and a strong desire to buy is shown by large consumers, there is a disposition to wait for the disposal of the old material on railroad lists now out. These lists are not so large as those of previous months, indicating that the reserve supply of scrap has diminished. The belief is strong that prices will be higher after the disposal of the railroad offerings. Dealers' quotations are continued as follows, per gross ton, New York:

Old girder and T rails for melting	$9.00 to	$9.50
Heavy melting steel scrap	9.00 to	9.50
Relaying rails	21.50 to	22.00
Rerolling rails	11.00 to	11.50
Iron car axles	19.50 to	20.00
Steel car axles	13.50 to	14.00
No. 1 railroad wrought	11.50 to	12.00
Wrought iron track scrap	10.00 to	10.50
No. 1 yard wrought, long	9.50 to	10.00
No. 1 yard wrought, short	8.75 to	9.25
Light iron	4.00 to	4.50
Cast borings	6.50 to	7.00
Wrought turnings	6.50 to	7.00
Wrought pipe	8.75 to	9.25
Carwheels	12.00 to	12.50
No. 1 heavy cast, broken up	11.50 to	12.00
Stove plate	8.50 to	9.00
Locomotive grate bars	7.50 to	8.00
Malleable cast	8.00 to	8.50

Ferroalloys.—Considerable of a flurry has existed in the market for 80 per cent. ferromanganese since last week's announcement of a reduction of $5 per ton to $40, seaboard, by the English producers. Toward the close of the week a further break in the price took place and large sales of the foreign product were made. It is admitted that 20,000 to 30,000 tons were contracted for at about $36 for the first half and $37 for the last half, with some sales made at $35, but not large amounts. It is understood that these low prices have now disappeared and that the $40 quotation is re-established, though this can probably be shaded considerably. It is thought that very little domestic ferromanganese was sold and that business covering a large part of the needs for the current year was placed recently. The price at which the Carnegie Steel Company is selling its product is understood to be not under $40, Pittsburgh. The recent inquiry for 6000 to 8000 tons of 50 per cent ferrosilicon has been placed with the Electro Metallurgical Company of America. Quotations remain at $73, Pittsburgh, for carloads; $72 for 100 tons and $71 for 600 tons and over.

The British Outlook Better

Trade Affected Favorably by Cheaper Money—Pig Iron Firm with More Inquiry

(*By Cable*)

LONDON, ENGLAND, February 4, 1914.

Preliminary estimates make the production of pig iron in Great Britain 10,479,000 gross tons in 1913, which is a record. The iron markets are affected favorably by cheaper money and the outlook continues to improve a little. Pig iron is firm, with more inquiry. Steel is firmer, with more doing, but the demand is spasmodic. Coke prices are falling. A price convention is being arranged on tin plate. Ferromanganese is irregular. Stocks of pig iron in Connal's stores are 137,015 gross tons, against 135,980 tons last week. We quote as follows:

Tin plates, coke 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 13s. 1½d. ($3.19), an advance of 1½d. (3c.).

(The following prices are per ton of 2240 lb.):

Cleveland pig iron warrants (Tuesday), 51s. 4½d. ($12.50), against 50s. 10d. ($12.36) one week ago.

No. 3 Cleveland pig iron, makers' price, f.o.b. Middlesbrough, 51s. 9d. ($12.59), against 51s. 6d. ($12.53) last week.

Hematite pig iron, f.o.b. Tees, 62s. 6d. ($15.21), an advance of 6d. (12c.).

Steel sheet bars (Welsh), delivered at works in Swansea Valley, £4 10s. ($21.89).

Steel bars, export, f.o.b. Clyde, £5 17s. 6d. ($28.59).

Steel joists, 15-in., export, f.o.b. Hull or Grimsby, £5 17s. 6d. ($28.59), an advance of 5s. ($1.22).

Steel ship plates, Scotch, delivered local yards, £6 17s. 6d. ($33.46).

Steel black sheets, No. 28, export, f.o.b. Liverpool, £9 ($43.80).

Steel rails, export, f.o.b. works port, £6 2s. 6d. ($29.81).

(The following prices are per export ton of 1015 kilos, equivalent to 2237.669 lb.):

German sheet bars, f.o.b. Antwerp, 81s. ($19.70).

German 2-in. billets, f.o.b. Antwerp, 76s. ($18.48).

German basic steel bars, f.o.b. Antwerp, £4 10s. ($21.89).

German joists, f.o.b. Antwerp, £5 2s. to £5 5s. ($24.82 to $25.55).

Metal Market

NEW YORK, February 4, 1914.

The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York			Lead		Spelter	
Jan.	Lake	Electrolytic	Tin, New York	New York	St. Louis	New York	St. Louis
29	15.00	14.62½	39.50	4.10	4.02½	5.40	5.25
30	15.00	14.62½	40.00	4.10	4.02½	5.40	5.25
31	15.00	14.62½	40.25	4.10	4.02½	5.40	5.25
Feb.							
2	15.00	14.75	40.50	4.15	4.05	5.40	5.25
3	15.00	14.75	40.50	4.15	4.05	5.40	5.25
4	15.00	14.75	40.87½	4.15	4.05	5.40	5.25

Copper is higher with the market again quiet. Tin has been fairly active and quotations have advanced. Lead is up five points and firm. Spelter is quiet but steady after advancing a few points. Antimony is dull with Cookson's a little lower.

New York

Copper.—In the latter part of last week a good business was done, especially by the larger agencies, on

both foreign and domestic account, the sales being made on a basis of 14.75c. delivered, cash, 30 days, or 14.62½c., cash, New York. In this buying, which occurred Friday and Saturday, domestic consumers are believed to have taken more than the foreign, conditions in this respect being reversed from what they had been for some weeks. The activity caused prices to advance to 14.75c., cash, New York, which is the quotation to-day. In view of the advances in copper the trade has been greatly puzzled by the action of the American Brass Company in announcing on Monday a reduction of ¼c. in its brass and copper products. Various theories to account for the reduction have been advanced, one of which is that the company may be well stocked with copper which it bought at a lower level and is willing to take a proportionate profit, while another is that it may not be willing to concede the justification for the higher prices now prevailing. Some Lake copper has been sold at 15c. Lake for March delivery is quoted at 15c. to 15.12½c., but is scarce. The exports of copper in January reached the big total of 35,566 tons. Exports this month total 1030 tons. The quotations in London to-day were £66 13s. 9d. for spot and £66 18s. 9d. for futures.

Copper Averages.—The Waterbury average for the month of January was 14.75c. The average New York price for Lake copper, based on daily quotations in *The Iron Age*, was 14.85½c. and for electrolytic, 14.46½c.

Tin.—Late on January 28 fair quantities of futures were taken by dealers. On Friday there was little doing. On Saturday a strenuous effort was made to buy, but little activity resulted for the reason that sellers were reluctant to let go, an attitude which resulted in the boosting of prices. On Monday the inquiries referred to still hung over the market but a stiff advance in Europe this time checked activity, although there was some selling of spot metal. One reason given for the advance abroad was that one London house bought 500 tons on that day. Yesterday, when London dropped about £1, action was stimulated and probably 300 tons was purchased in deliveries that ran from spot to June, dealers and consumers taking in the aggregate about even quantities. In view of the fair quantities which have been bought recently, deliveries will be ample in the next few months. The deliveries into consumption in January were good, amounting to 3600 tons as against 3700 tons in the same month last year. The total visible supply January 1, 1914, was 14,859 tons, which is 888 tons above that of January 31, 1913. In stock and landing January 31 was 1834 tons. Arrivals this month total 555 tons and there is afloat 1995 tons. The New York price to-day is 40.87½c. and the London quotations are £186 5s. for spot and £187 5s. for futures.

Lead.—The demand is fair and the New York quotation is five points higher than it was a week ago, having been advanced to 4.15c. by the American Smelting & Refining Company on Monday. Despite the low price the market is considered to be in a healthy condition. The St. Louis price is 4.05c.

Spelter.—The market is quiet but steady at 5.40c. to 5.45c., New York, and 5.25c. to 5.30c., St. Louis.

Antimony.—Quiet prevails and prices are unchanged except that Cookson's is off a few points. Quotations are 7c. to 7.12½c. for Hallett's, 7.25c. to 7.37½c. for Cookson's and 6c. to 6½c. for Chinese and Hungarian brands.

Old Metals.—The copper market has so far improved that dealers have again marked up their selling prices and quote as follows:

	Cents per lb.
Copper, heavy and crucible	14.25 to 14.50
Copper, heavy and wire	13.75 to 14.00
Copper, light and bottoms	12.75 to 13.00
Brass, heavy	9.00 to 9.25
Brass, light	7.75 to 8.00
Heavy machine composition	12.25 to 12.50
Clean brass turnings	8.75 to 9.00
Composition turnings	11.50 to 11.75
Lead, heavy	3.90
Lead, tea	3.65
Zinc, scrap	4.10

Chicago

FEBRUARY 2.—Buying of copper, both for domestic and foreign consumption, featured an active week of strengthening tendencies. We quote as follows: Casting copper, 14.75c.; Lake copper, 15c. to 15.25c.; for prompt shipment; small lots, ¼c. to ⅜c. higher; pig tin, carloads, 40.25c.; small lots, 42.25c.; lead, desilverized, 4.05c., and corroding, 4.35c., for 50-ton lots; in carloads, 2½c. per 100 lb. higher; spelter, 5.25c. to 5.30c.; Cookson's antimony, 9.50c.; other grades, 8c.; sheet zinc, $7.25, f.o.b. La Salle or Peru, Ill., less 8 per cent. discount in carloads of 600-lb. casks. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 11.50c.; copper bottoms, 10.25c.; copper clips, 11c.; red brass, 10.75c.; yellow brass, 8c.; lead pipe, 3.50c.; zinc, 3.75c.; pewter, No. 1, 23c.; tin foil, 28c.; block tin pipe, 31c.

St. Louis

FEBRUARY 2.—A firmer tendency has been evidenced in metals, particularly those of Missouri production. Lead is quotable to-day at 4.05c. to 4.07½c.; spelter, 5.25c.; tin, 40.22½c. to 40.50c.; Lake copper, 15.25c. to 15.35c.; electrolytic copper, 15.10c. to 15.25c.; Cookson's antimony, 7.75c. to 7.85c. In the Joplin market sulphide ores were higher, the top settlement running to $45 per ton on an assay basis of 60 per cent. at $42. Calamine brought $20 to $21 for 40 per cent., with the top settlement up to $25. The demand was good. Lead ore was unchanged but strong at $50 for 80 per cent. In general a better situation prevails with indications of further early advances. We quote miscellaneous scrap metals as follows: Light brass, 4.50c.; heavy yellow brass, 7c.; heavy red brass and light copper, 8.50c.; heavy copper and copper wire, 9.50c.; zinc, 2.75c.; lead, 3c.; pewter, 22c.; tinfoil, 27c.; tea lead, 2.75c.

Iron and Industrial Stocks

NEW YORK, February 4, 1914.

The stock market shows sustained strength. Brokerage houses report an increase in the investment demand for securities. Confidence seems to have fully returned. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chal., com.	12½- 13¾	Pittsburgh Steel, pref.	92¾- 93
Allis-Chal., pref.	48 - 48½	Pressed St'l, com.	35½- 45½
Am. Can, com.	31½- 31⅞	Pressed St'l, pref.	102 -104
Am. Can, pref.	94⅛- 95⅞	Ry. Spring, com.	30⅜- 34⅜
Am. Car & Fdry., com.	49½- 53	Ry. Spring, pref.	98 -100
Am. Car & Fdry., pref.	114 -115½	Republic, com.	24¾- 26¾
Am. Loco., com.	34¾- 37¼	Republic, pref.	88⅜- 90
Am. Loco., pref.	101 -101½	Rumely Co., com.	11¾- 15¾
Am. Steel Fdries.	34 - 36	Rumely Co., pref.	26½- 35⅜
Bald. Loco., com.	45½	Sloss, com.	34 - 35
Bald. Loco., pref.	106⅛	Sloss, pref.	92
Beth. Steel, com.	35½- 37½	Pipe, com.	12½- 13½
Beth. Steel, pref.	77 - 80	Pipe, pref.	47
Case (J. I.), pref.	91⅞- 92	U. S. Steel, com.	64⅜- 67⅛
Colorado Fuel	31¾- 34	U. S. Steel, pref.	110½-112⅜
Deere & Co., pref.	98 - 99¾	Va. I. C. & Coke.	48 - 50
General Electric.	146 -148⅝	West'gh'se Elec.	69 - 71⅞
Gt. N. Ore Cert.	36½- 39	Am. Ship, com.	41 - 44
Int. Harv., com.	109¾-111½	Am. Ship, pref.	91
Int. Harv., pref.	116⅝-116⅞	Chic. Pneu. Tool.	53½- 55½
Int. Harv., Corp.	109⅜-110¼	Cambria Steel	49⅝- 50¾
Int. Harv. Corp., pref.	116½	Lake Sup. Corp.	22½- 23¼
Int. Pump, com.	9	Pa. Steel, pref.	64⅞- 65
Int. Pump, pref.	26 - 27½	Cruc. Steel, com.	16½- 16⅞
Nat. Enam. & St., com.	13 - 14	Cruc. Steel, pref.	93¼- 94⅞
		Harb. Wk. Ref., pref.	99
		La Belle Iron, com.	43¼- 44

Dividends Declared

The Eastern Steel Company, regular quarterly, 1¾ per cent., on the first preferred stock, payable March 16.

The General Fire Proofing Company, special, 1 per cent., on the common stock, paid February 2.

The Inland Steel Company, regular quarterly, 1¾ per cent., payable March 2. The reason for the omission of the customary extra dividend was that the directors did not feel justified in declaring one at this time. For the past three years they declared 3 per cent. extra at January meetings, making 10 per cent. for the year.

The Pressed Steel Car Company, special, 3 per cent., on the common stock, to be paid quarterly in 1914, the first instalment payable March 11. This is the first dividend on the common stock declared by this company in nearly 10 years.

Personal

Victor F. J. Tlach, managing director Darwin & Milner, Ltd., Sheffield, England, is in this country for a stay of several weeks. His company has an American branch, of which he is president, with offices at 281-283 Water street, New York. Mr. Tlach is especially interested in cobalt high speed steels, his company being licensed to manufacture that product under the patents granted to the Becker Steel Works, Willich, Germany. Darwin & Milner, Ltd., control the Spartan Steel Company, Ltd., Beeley Wood Steel Company, Ltd., Nelson Tool Company, Ltd., and Sheffield Annealing Works Company, Ltd., all of Sheffield.

F. H. Kindl, consulting engineer, Pittsburgh, underwent a serious operation in a hospital in that city, February 3.

J. G. Hershey, formerly in the purchasing department of the Crucible Steel Company of America, Pittsburgh, has resigned and is now connected as a salesman with Max Solomon, dealer in iron and steel scrap, Oliver Building, Pittsburgh.

Starkey Sanford is now in charge of sales, erection and advertising for the Riter-Conley Mfg. Company, Pittsburgh.

F. J. Stolle, Cincinnati, Ohio, who has been prominently identified with the iron and steel trade in the Central West for over 15 years, has been appointed sales agent for the Laclede Steel Company, of St. Louis. His offices are in the First National Bank Building.

A. H. Kramer has been elected president of the Advance Foundry Company, Dayton, Ohio, succeeding Thomas Sweetman, resigned.

A. B. Hall, for the past 14 years connected with the machinists' supply department of the Whitman & Barnes Mfg. Company, was elected a director and second vice-president of the company at the annual stockholders' meeting held January 28 at the general offices, Akron, Ohio.

At a recent meeting of the Miami Iron & Steel Company, Hamilton, Ohio, the following officers were re-elected: President, E. M. Peters; vice-president, E. N. Ohl; secretary and treasurer, E. C. Siemer.

W. J. Clauson, secretary and general traveling representative of the Milwaukee Stamping Company, manufacturing hardware specialties in West Allis, Wis., was a passenger on the ill-fated Old Dominion liner Monroe which was sunk off Norfolk, Va., in collision with the Nantucket on January 30. He was reported among the drowned until January 31, when he was able to communicate with his home in Milwaukee.

D. D. Pendleton, formerly Pittsburgh representative of the Wheeler Condenser & Engineering Company, Carteret, N. J., has been transferred to the home office, and has been succeeded in Pittsburgh by Nathan Owotz, formerly in charge of the Cincinnati office.

David B. Mullen, superintendent of open-hearth plant No. 4 of the Homestead works of the Carnegie Steel Company, has resigned to take charge of the open-hearth department of the Cambria Steel Company, Johnstown, Pa.

W. D. Sayle, president Cleveland Punch & Shear Works Company, and F. W. Bruch, president Acme Machinery Company, Cleveland, Ohio, leave this week for Miami, Florida, where they expect to spend about a month.

Robert L. Ireland and M. McMurray, of M. A. Hanna & Co., Cleveland, Ohio, sailed last week for Europe. They will spend about two months touring the Continent.

H. B. Charles, purchasing agent for the McClintic-Marshall Company, Pittsburgh, has resigned to accept a similar position with the American Zinc Company, which is building a large plant at Burgettstown, Pa.

E. W. Orrison, formerly of Baltimore, has succeeded H. O. Connelly as Pittsburgh representative of the Cleveland Pneumatic Tool Company. Mr. Connelly returns to the home office at Cleveland.

John W. Lieb, Jr., will deliver an illustrated lecture on "Leonardo da Vinci, Mechanical Engineer," before the Stevens Engineering Society, in the auditorium of Stevens Institute of Technology, Castle Point, Hoboken, N. J., on the evening of Friday, February 20.

Henry C. DuBois, formerly connected with the Philadelphia office of Crocker Brothers, has been appointed manager of sales of Sinclair & Morfit, dealers in coal and coke, with offices in the Witherspoon Building, Philadelphia, Pa., and at Fairmount, W. Va. He took up his new duties February 1.

Obituary

WILLIAM RUNKLE, president and treasurer Warren Foundry & Machine Company, died January 31 at his home in Orange, N. J., aged 69 years. He was born at Asbury, N. J., and obtained the greater part of his eduction at Bloomfield Academy. At the age of 20, in 1865, he was made a clerk in the company's plant at Phillipsburg, N. J., and became familiar with all the details in the manufacture of cast-iron pipe. On November 24, 1874, he was appointed selling agent at New York City. Before his appointment about one-fifth of the company's total output was sold by the New York office, but in less than three years Mr. Runkle had the management of all the sales. In 1875 he was elected a director of the company; in February, 1890, vice-president, and on the death of his father, November 25, 1890, president and treasurer, holding that official connection until his death. Under his management the Warren Foundry & Machine Company greatly increased in importance and its plant was doubled and trebled. At various times Mr. Runkle served as a director in numerous other corporations, but from 1902 he gave his entire time to the business of the Warren Company. His whole life, in fact, may be said to have been devoted to its interests. He leaves no immediate family, his wife having died a few years ago without children.

JAMES H. BAKER, a well-known manufacturer of forgings and specialties, died at the home of his daughter in Avalon, Pa., January 31, aged 71 years. He was born in Strasburg, Va., and was working as a blacksmith at the outbreak of the civil war when he joined the Confederate army as a cavalryman, becoming a member of "Stonewall" Jackson's staff. He served the entire four years. After the war he returned to Strasburg and opened a blacksmith shop. Several years later he went to Urbana, Ohio, where he ran a wagon and hardware factory. In 1887 he went to Pittsburgh, where he founded the Baker Chain & Wagon Iron Mfg. Company. After six years he severed that connection and became president of the Baker Forge Company, Ellwood City, Pa. Some years afterward he gave up active connection with outside concerns and maintained an office in Pittsburgh as an expert in the manufacture of forgings, later removing to Cleveland, Ohio. He gave much attention to the heat treatment of iron and steel forgings and was a contributor to *The Iron Age* and other trade publications. He was a member of the Engineers' Society of Western Pennsylvania and the Duquesne Club of Pittsburgh. He leaves five daughters.

SAMUEL W. VAUGHEN, a well-known blast furnaceman, died at Lorain, Ohio, January 28, aged 63 years. He had been connected with blast furnace operations at the Cambria Iron Company, and later Cambria Steel Company, plant at Johnstown, Pa., for over 30 years. In 1905 he became superintendent of the blast furnaces of the National Tube Company at Lorain, Ohio, continuing in that capacity for seven years. He invented a number of blast furnace appliances, the best-known of which is the Vaughen gun, used for closing furnace tap holes.

EDWIN STARR SPERRY, formerly an instructor in chemistry at Yale University, and for the last ten years editor and publisher of the Brass World and Plater's Guide, died at his home in Bridgeport, Conn., January 31, aged 48 years. He was graduated from the Sheffield Scientific School at Yale in 1884, and was a member

of many learned societies in this country and Europe. He leaves a widow.

ARTHUR BREESE PROAL, New York City, died suddenly February 3 from pneumonia, following closely upon an operation for appendicitis. He was president of the Union Carbide Company and the Electric Lamp Company, secretary of the Polar Construction Company, and a director in many other corporations. He leaves a widow.

CHARLES F. BINGHAM, president Bingham Iron Works, Buffalo, N. Y., died February 3 at Palm Beach, Fla., aged 69 years.

Methods of Rating Men

The question of rating men was made the subject of one of the sessions of the annual meeting of the Efficiency Society, held last week at the Biltmore Hotel, New York City. Addresses were made on this topic on Tuesday afternoon, January 27, by Roger W. Babson, Babson Statistical Organization, Boston, by Dr. Katherine M. H. Blatchford, New York, and by Dr. Gustave Blumenthal, of the Vocational Guidance Bureau, Washington, D. C.

Mr. Babson divided the methods of rating men into six classes. The oldest and most spectacular was, he said, that of Dr. Blatchford. Among other things it embraced a consideration of the look of the applicant's eye, the color of his hair, the shape of the chin, general physique, etc. He regarded the method exceedingly good for hiring and firing and for transferring men from department to department, as suited their aptitude. He felt that Dr. Blatchford had done a public service in publishing a manual on the subject, which he thought was a distinct help to employers of labor. One question which arose with him is whether or not Dr. Blatchford can impart the knowledge of rating to others.

He placed in a second group a method developed by W. M. Horner, Minneapolis, in making successful salesmen of life insurance. This appeared to study a human subject under five main divisions, such as habits of work, results and the like. Each of these general divisions are subdivided and a method of assigning percentage figures is employed to establish the rating of each individual. While it is suggested there might be some question about the method as giving an absolute rating, it was certainly calculated to give an idea of the improvement of the individual. It was, of course, a method of rating as distinguished from the Blatchford system of selecting men.

A third method is that developed by H. A. Hopf, Germania Life Insurance Company, New York, who has evolved a detailed system of ascertaining the records of office employees and marking them on that basis. A fourth method is that which was developed by the Alexander Hamilton Institute of New York, which while having general divisions under which a given individual may be rated, has so subdivided the divisions that positive or negative characteristics may be checked under each division, each set listed with various qualifications or modifications, all with the idea of eliminating to a great extent the prejudice or personal equation of the one doing the rating. Under the fifth classification, he placed the grade cards developed by Mrs. Melvil Dewey, in which the attempt is made to rate the personal character of the individual.

Dr. Blatchford explained at length her tabulated scheme of analysis of the individual, and paid particular attention to the advantage of employment blanks, in which it is possible to study the attitude of the applicant in filling out the blank, and by means of which it is possible to get a line also on his education and general character. One of the interesting details in this connection is a long list of positive and negative characteristics, such as carefulness, carelessness, punctuality, tardiness, industriousness, laziness and the like, which the applicant is supposed to check as descriptive of himself, and it appears that it is not so much the answer or checking given to the list as to the manner in which the checking is done.

Dr. Blumenthal asserted that no good would come of the efficiency movement unless it was altruistic first and commercial afterward. He described at length the exceptional means taken to ascertain the aptitude of school pupils in Washington about to leave school at the ages of 13 to 15 years, particularly. After the bureau's determinations of the probably best vocation for the pupil, the bureau has arranged to send the applicant to a representative in Washington of each vocation, so that finally the applicant may have the advantage of the advice and judgment of one who knows the most about the particular vocation.

Prize Offered to Members of Associated Foundry Foremen

Through an arrangement effected at a meeting held in Chicago, January 17, between the officers of the Associated Foundry Foremen, S. V. Blair, Kalamazoo Stove Company, Kalamazoo, Mich., president, and Robert B. Thomson, Buffalo Pitts Company, secretary, and David McLain, manager, McLain's System, Milwaukee, Wis., the opportunity to pursue a course in the McLain school, covering mixing irons and cupola practice, is given without charge to a member of the association. The officers of the association have decided, with the object of building up the association, to award the chance to take the course as a prize to the member getting the most members in the association between February 1 and September 1 this year. It is stipulated that in the event that a graduate of the school wins the prize, the money equivalent will be awarded. Details can, of course, be obtained from the secretary, Mr. Thomson, 78 Verplanck street, Buffalo, N. Y.

It is announced that the Brock Electric Vehicle Company, Cleveland, Ohio, the Argo Electric Vehicle Company, Saginaw, Mich., and the Borland-Grannis Company, Chicago, manufacturers of electric vehicles, will be merged, with a capital stock of $1,250,000. Frederick A. Brand, president and general manager of the Brock Company, will be president and general manager of the new organization, which will be known as the American Electric Car Company. U. B. Grannis and Bruce Borland, both of Chicago, will be vice-presidents, and Theodore Huss, also of Chicago, secretary and treasurer.

The 1914 sales convention of the American Blower Company was held in Detroit, Mich., January 28 to 30. It was attended by 50 of the company's sales and engineering representatives. The banquet was held at the Cadillac Hotel. Business sessions were held both at the hotel and the company's home offices. Many important and interesting subjects were discussed and decided upon. Contrary to expectations, pessimism had no place during any part of the convention, and everybody left confident of even more and better business for 1914 than was booked last year.

The F. S. Converse Company, Lestershire, N. Y., has filed articles of incorporation with a capital stock of $75,000, to take over the business of F. S. Converse, manufacturer of coal handling machinery and tools. F. S. and M. F. Converse, Binghamton, N. Y., and E. A. Reynolds, Lestershire, are the directors.

Pittsburgh and Valleys Business Notes

The Hunting-Davis Company has about completed plans for the new plant to be built on Preble avenue, North Side, Pittsburgh, for the McKinney Mfg. Company, manufacturer of hinges, barn door hangers and other specialties. The new building is to be 105 x 120 ft., six stories, of brick and reinforced concrete. The work also includes a concrete tunnel, 8 x 10 x 40 ft. to be built under the street to connect the present works with the new building, also a steel reinforced concrete bridge, 40 ft. long, over the street. The new plant is estimated to cost about $100,000.

The reorganization of the Oil City Boiler Works, Oil City, Pa., has been completed. Charles P. Berry has succeeded George S. Oberly as secretary and treasurer, and J. E. McClintic, formerly general manager, has been transferred to the Chicago district, in charge of sales in that territory. B. B. Freer, formerly New York representative, goes to Oil City as general sales manager, and H. A. Wege, formerly with the Titusville Iron Works, succeeds E. W. Smiley as purchasing agent. Mr. Oberly is no longer with the company. Changes have been made in all shop superintendents and foremen of departments.

The General Fire Proofing Company, Youngstown, Ohio, held its annual meeting last week and re-elected the directors—M. I. Arms, W. H. Foster, W. P. Arms, Charles H. Booth, J. T. Harrington, A. P. White and Henry Wick. The officers reported a good year, with business increasing in every department and a very large increase in orders for metal furniture. Myron I. Arms was re-elected chairman of the board; W. H. Foster, president; J. T. Harrington and A. P. White, vice-presidents; R. M. Bell, secretary and treasurer; C. Y. Farrell, assistant treasurer and cashier.

The stockholders of the New Castle Portland Cement Company, New Castle, Pa., have elected officers as follows: George Greer, president; Edwin N. Ohl, vice-president; Elmer I. Phillips, treasurer, and Charles Greer, secretary and assistant treasurer.

The Wheeling Mold & Foundry Company, Wheeling, W. Va., held its annual meeting last week and voted to increase the capital stock from $750,000 to $1,000,000. The par value of each share was increased from $50 to $100. The old board of directors was re-elected.

The A. & S. Wilson Company, Pittsburgh, has received a contract for a new power house for the Consolidated Traction Company, to be erected at Lowellville, Ohio. Contracts for part of the equipment have been placed with the Edgemoor Iron Works, Vulcan Blower Company, American Engineering Company and Taylor Stoker Company.

The Warren Tool & Forge Company, Warren, Ohio, has re-elected officers as follows: James Robertson, president; M. J. Konold, vice-president and secretary; George E. Warner, treasurer; George F. Konold, general manager.

The annual meeting of stockholders of the Brier Hill Steel Company, Youngstown, Ohio, was held last week at which officers and directors were elected as follows: W. A. Thomas, president; John Tod, first vice-president; R. C. Steese, vice-president and general manager; J. G. Butler, Jr., vice-president; J. E. Parker, secretary; John Stambaugh, treasurer; H. H. Stambaugh, chairman board of directors; E. L. Ford, chairman advisory committee; J. B. Kennedy, general counsel. Directors, H. H. Stambaugh, John Stambaugh, David Tod, John Tod, R. C. Steese, J. G. Butler, Jr., E. L. Ford, W. A. Thomas and C. G. Thomas.

At the annual meeting of stockholders of the Standard Underground Cable Company, Pittsburgh, last week, the stockholders unanimously approved the proposition to take over the stock of the Canadian plant. The retiring board of directors was re-elected, and the stockholders voted a formal resolution approving the management of the company.

The George T. Ladd Company, power plant engineer, Farmers' Bank Building, Pittsburgh, has received an order from the Forged Steel Wheel Company, Butler, Pa., for the installation of a 10,000 hp. capacity open-type feed-water heater, made by the E. T. Calles Company, Chicago, and has also received an order from the Republic Iron & Steel Company, Youngstown, Ohio, for the installation of two 200 hp. single valve, side crank, Ames automatic engines, to be direct connected to constant pressure fans for its by-product coke ovens.

The Standard Seamless Tube Company has started to place contracts for the erection of its new seamless tube plant to be built at Economy, Pa. The main building will be 100 x 400 ft. and will require about 1200 tons of structural steel. The general offices of this company, located in the Germania National Bank Building, Pittsburgh, have in charge the placing of the contracts.

The National Tube Company, Pittsburgh, has placed an order with the Chicago Pneumatic Tool Company, Chicago, for a 1200-ft. capacity air compressor, to be installed in its Riverside works at Wheeling, W. Va.

At the annual meeting of the Youngstown Foundry & Machine Company, Youngstown, Ohio, January 27, the old directors were re-elected. In the past year the company enlarged its plant by the erection of two steel buildings, one of which is a machine shop, 60 x 200 ft., and the other a cleaning shop, 70 x 90 ft. Both are equipped with electric traveling cranes.

Warm-Air Furnace Makers Organize

To advance the interest of the warm-air furnace industry an organization of furnace makers was effected in Cleveland, Ohio, January 22, under the name of the National Warm Air Heating and Ventilating Association. A permanent organization was effected by the election of the following officers: President, John D. Green, Detroit Stove Works, Detroit, Mich.; vice-president, F. T. Giblin, Giblin & Co., Utica, N. Y.; treasurer, W. G. Wise, Wise Furnace Company, Akron, Ohio; executive committee, E. P. Miller, Lennox Furnace Company, Marshalltown, Iowa; John D. Howard, P. D. Beckwith Estate, Dowagiac, Mich., and F. C. Seelbach, Forest City Foundry & Mfg. Company, Cleveland. The selection of a permanent secretary was left to the executive committee.

A canvass of those present showed that there were between 30 and 35 furnace manufacturers in attendance and between 55 and 60 in accord with the movement, and in addition a number of makers of furnace accessories. The object of the organization is described as follows: "To promote the proper installation of warm-air heating systems through systematic education in every department of the industry," and the membership is to consist of manufacturers of any component parts of warm-air heating system.

The Hartmann, Hay & Reis Company, Belleville, Ill., states that it has discontinued the manufacture of cut nails, dismantling the rolling mill and nail factory. The owners have organized a new company under the name of the Germania Refrigeration & Machinery Company, incorporated with $150,000 capital stock, and will manufacture in the old plant of the Hartmann, Hay & Reis Company refrigerating systems, designed for use in residences, cafés, meat markets, apartment houses, hotels, etc., and in fact, wherever an ice machine or refrigerating plant can be installed. They have taken over the plant of the Germania Refrigeration & Machinery Company, San Antonio, Texas, which has been in successful operation for a number of years. The systems which the company will make are automatic and "foolproof." Practically all of the machinery has been installed and it will be in full operation by March 1. E. E. Wangelin is president; Hubert Hartmann, Jr., vice-president; W. G. E. Rolaff, secretary; Henry Reis, treasurer.

The General Machinery & Supply Company, a Kansas corporation, with office at Pittsburg, Kan., has been organized with a capital stock of $15,000 by S. A. Rose, Thomas McNally and C. W. Waterman.

THE STEEL CORPORATION SUIT

The Hearing Resumed in New York City—Some Competitors Examined—Why National Tube Was Formed

The hearing in the suit of the Government for the dissolution of the United States Steel Corporation was resumed at 71 Broadway, New York, on Monday, February 2. The presentation of testimony for the defense was continued.

Austin D. Mixsell, general sales agent of the Bethlehem Steel Company, testified that the period since 1906 was one of special development on the part of that company. In 1906 the value of its output was about $10,000,000, but in 1912 the value was nearly $38,000,000. This was its largest year. Regarding the matter of prices, he testified that he had been with the Bethlehem Steel Company since 1908 in his present capacity, and that during this time he has always had discretionary powers in selling the products of the company. He said that a minimum price was fixed by the officials that he was not allowed to go below. He further said that he never participated in any pool, nor was his selling price fixed by any one.

Edwin M. S. Young, general sales manager of the Allegheny Steel Company from 1905 to 1911, but vice-president and general manager of the Beaver Falls Steel Company since January 1 last, said that in 1905 the output of the Allegheny Company was about 75,000 to 80,000 tons, but it subsequently doubled that production. He was the sole authority for making prices, but on certain occasions he would confer with the president of the company. He said that during the period he was with the company prices were never fixed as a result of any understanding with any competitor.

NATIONAL TUBE COMPANY'S FORMATION

Edward Worcester, first vice-president and general manager of the National Tube Company, told of the formation of that company in 1898 at a time when tube manufacturers all over the country were facing bankruptcy. He testified that the price of steel tubing had been fixed by him, and not by anybody else, and that no agreements of any kind were entered into with competitors. He stated that the manufacture of steel tubes began about 1885. Its price was from 2½ to 5 per cent. lower than that of iron pipe. He then described the demoralized condition of the industry from 1893 to 1898, saying that one concern was losing $1000 a day; that another was in the hands of receivers, and a third was facing bankruptcy. In an effort to reduce the cost weights were cut and inferior materials were used.

Mr. Worcester stated that in making prices he was "never controlled" by anybody, but that he frequently consulted with the president of the company. He said that the Standard Oil Company was the largest purchaser of steel tubing. The National Tube Company's capacity, he said, was 36 per cent. of the total for the country.

Col. H. P. Bope, first vice-president and general sales manager of the Carnegie Steel Company, testified on Tuesday along much the same lines as have been pursued by the defense for several months. He admitted that there had been a plate pool some years ago by which prices were fixed and allotments of orders made, but said that these were discontinued as soon as Judge Gary, chairman of the Steel Corporation, learned of them. He said that he fixed prices without consulting the sales managers of competing concerns. As a rule, he said, when one company lowered its prices the others would follow suit.

J. White Strong, purchasing agent for the Delaware & Hudson Railroad Company, testified to the existence of competition between the Steel Corporation subsidiaries and the independents, resulting in an open market, in which he bought on the best terms offered.

Federal Bureau of Labor Safety

WASHINGTON, D. C., February 3, 1914.—The creation of a bureau of labor safety in the new Department of Labor is considered likely at the present session of Congress. The House Committee on Labor has reported a bill to that end with a favorable recommendation. It provides for the appointment of a Commissioner of Labor Safety, at a salary of $5000 a year, a chief clerk "and such experts, special agents, clerks and other employees as may be authorized from time to time by law." It is made the duty of the Bureau of Labor Safety to investigate labor safety plans and devices of all kinds and the need therefor, to study vocational diseases and to gather information concerning the use of safety plans and devices in the industries of the United States and elsewhere. Provision is made for a museum for the exhibition of devices for safeguarding machinery and lessening dangerous conditions and for exhibits relating to the prevention and control of industrial diseases. A laboratory is to be attached to the museum.

Secretary of Labor Wilson, in urging the creation of the proposed bureau, says that while it cannot have police powers to regulate the use of safety devices except in those classes of industry which come under Federal jurisdiction, it would have great value in acting as a clearing house for all the information on labor safety available in the various States and in foreign countries. The Secretary refers also to the moral effect upon State legislatures and the public of the investigations and reports of the proposed bureau.

The stockholders of the Acklin Stamping Company, Toledo, Ohio, have re-elected J. M. Acklin, vice-president and general manager; W. C. Acklin, secretary and treasurer, and D. T. Anderson, superintendent. The reports submitted to the stockholders showed that 1913 was the most prosperous in the history of the company, the sales having been 50 per cent. greater than those of the preceding year. Although two extensions had been made to the plant in the past year, the board of directors authorized a committee to provide for a further enlargement. Indications point to another highly prosperous year.

The Chamber of Commerce of the United States of America, whose general offices are in the Riggs Building, Washington, D. C., will hold its second annual meeting in the new Willard Hotel, Washington, February 11 to 13. A comprehensive programme has been arranged in which men of national prominence will take conspicuous part. Two entire days will be given to the consideration of anti-trust legislation and the maintenance of re-sale prices.

Arthur G. McKee, engineer, Cleveland, Ohio, has been given a contract for the erection of ten 225-ton ore bins, of the Baker suspension type, and a double discharge coke bin, feeding directly to the skip cars, and with a motor operated screening device, for the Soho plant of the Jones & Laughlin Steel Company, Pittsburgh. The contract also includes a 30 cu. yd. scale car and the erection of a steel trestle.

Systematizing the Purchasing Department

How Savings of Time and Money Can Be Secured by Applying a System to This Branch of a Business

BY H. D. EVANS

In designing a system to meet the demands of a department of any business, the object should be to provide one which will enable that department to perform its work efficiently with the minimum amount of labor. Probably the factory accounting department of a manufacturing business has received the closest study along the lines of systematic development. As a result a large number of companies are now operating a department which determines costs by means of a system which is practically uniform. The reason for this is easily understood because the field of accounting has a large following of earnest and capably trained men and the work affords an interesting study for the development of new ideas and methods.

The needs of the purchasing department have heretofore not been so well understood, nor has its importance in relation to the business been fully appreciated. Its methods are, in most cases, the result of individual effort, for which the purchasing agent himself is usually responsible, and he, through lack of experience, may be incapable of conducting it along the lines of efficiency. Thus it will be found that a great many purchasing departments, and those of some large companies, are so devoid of systematic endeavor that the most essential information is not available. On the other hand, in many instances where a company has found recourse to the employment of a firm of auditors to install a system for its purchasing department, the forms employed have been so numerous as to demand a large additional clerical force for the performance of much unnecessary work, thereby creating a burdensome amount of red tape and defeating the very purpose which the system is designed to accomplish.

A system to be efficient must be simple and this is particularly true when applied to a purchasing department, as an accumulation of work unattended to must necessarily cause confusion and resultant delays in the factory, which is depending solely upon this department for the material required in the manufacture of its product.

We shall illustrate and describe herein the forms in use in the purchasing department of a large Pittsburgh concern, which were developed by their purchasing agent after 15 years of experience with several large manufacturers in this field of work.

Purchase Record Card.—After the purchse orders for the day have been issued the copies are grouped together and transcribed onto the purchase record card, as shown in Fig. 1, the name of the article being written in the upper left hand corner of the card, which is filed alphabetically under material classification. The card is 6 x 9 in. and fits a standard drawer cabinet. The information provided for at the top can be gathered and inserted at any convenient time. The spaces "How Used," "Material," "Weight," "Maximum" and "Minimum," are of value only where the factory is devoted to the manufacture of a specific article and the purchase of this material may occur from time to time. On cards covering record of purchase of miscellaneous material or shop supplies these spaces remain blank. The purchasing agent who wishes to guard against the possibilities of error will find this information of invaluable assistance where the nature of the company's business suggests its use.

The card shows a complete record of the order from the time it is issued until the material is received at the factory. The spaces provided for the price and f.o.b. point under the heading "Order" cannot always be filled in at the time the order is placed, as very often prices have not been specifically quoted or agreed upon, but this information should in such cases be inserted when the invoice is received. The price column under the heading "Invoice" should not show any figures, but simply a check mark, as the price is invariably treated as a part of the order and the invoice checked against it. The column "Remarks" in the center of the card is used principally for the insertion of credits which may be issued to correct the price or to cancel the charge for material returned after an invoice has been received and posted. The column "Remarks" at the right hand side is for any information which may be necessary or desirable for future reference and should be inserted at the time the copy of the order is posted.

Springs Steel 7.2"

HOW USED: One on #3 agr

MATERIAL: Spec #88 — MAX 15,000

WEIGHT: .06# each — MIN 5,000

ORDER										REMARKS	INVOICE			RECEIPTS			REMARKS
ORDER NO.	NAME	DATE	QUANTITY	PRICE							DATE	QUANTITY	PRICE	DATE	QUANTITY	R.S. NO.	
				LIST	DISC'T	NET	UNIT	F.O.B.									
		1913															7.2" B.T. 1.52 #15 B.W.G.
13670	Gen. Coil Spring Co	8/10	15000			15¢	M	Pgh.			8/25	15038	✓	9/2	15050	882	9/16 I.B. 24" Loop
16725	Pgh. Spiral Spring Co	10/1	15000			16¢	M	Pgh.			10/8	15000	✓	10/20	15000	1692	200

Fig. 1—Purchase Record Card

Upon receipt of requisitions from the storekeeper reference should always be made to this card, which, in furnishing a complete history of past transactions, serves as a check against a purchase of unsuitable material and facilitates the placing of repeat orders.

"Follow Up" or "Reminder Copy."—This is an exact copy of the original purchase order as it is

10/1/13

Order No. 16738

Department Stock Pittsburgh Spiral Spring Company.
Pittsburgh, Pa.

REMINDER MEMO.

15,000 Spiral Steel Springs 7.2# Compression
#15 B. W. G. Wire 9/16" I. D., 2-1/2" long

In accordance with our material specification #88 and B. P. #452, copies of which are attached hereto.

Ship October 15th or earlier

File in Drawer No.

MUST BE FILED EVERY NIGHT

Fig. 2—Follow Up or Reminder Copy

issued, and its relation to the work is very important, since it is from this copy that the purchasing department is reminded of the orders unfilled. Many concerns use an index card for this purpose, transcribing from the copy of the order to the card the order number, date, etc. This necessitates considerable clerical work and the results obtained are generally unsatisfactory, since the one whose duty it is to follow up these orders should have an exact copy of the order before him to enable him to deal with his subject intelligently.

The reminder copy of an order, shown by Fig. 2, is reddish in color and is printed on onion skin paper. After the order is issued this copy is given to one who might be designated a stock-chaser, and who marks in one of the spaces provided at the bottom the date on which shipment is desired.

A vertical letter file is equipped with index or guides, numbered 1 to 31, to correspond with the calendar. A folder is placed between each one of these guides and the follow-up copy is filed under the date on which it is to receive attention. Each day these copies which have accumulated in the file under that date should be taken out and some action taken to effect delivery.

The purchase record card should be first consulted to determine whether the invoice has already been received, and if not, shipment may be requested by letter. All correspondence relating to shipment should be briefly noted on these reminder copies and the original correspondence passed on to be noted on or filed with the permanent copy of an order. The stock-chaser should endeavor to file his reminder copies, after writing his inquiries about shipment, so that they can be found when replies to his letter are received.

As a suggestion they may be filed ahead two days from the date of writing, and those which are not answered may be given another date, and so on, until it becomes apparent that the inquiry has been overlooked, when such action as suggests itself may be taken. By making it a point to note briefly on these reminder copies important extracts from the correspondence relating to shipment, reference to the permanent copy of order or letter file is rendered unnecessary in the follow-up work and much time is saved. These copies may be destroyed after an invoice denoting shipment has been received.

The purchase order should be made out in six copies—original, purchasing department, receiver's copy, storekeeper's copy, and inspector's copy where an inspector is employed, and also the reminder memo copy referred to above. When a purchase order is issued the article purchased should be covered by a full description, as it then becomes a matter of permanent record and can be referred to at any future time when desired.

The purchasing department copy of an order should be filed temporarily under material class until invoice is received and checked off, when it is filed numerically by order number. This is convenient for quick reference, since the purchase order number can always be found by referring to the purchase record card. The receiver's copy should be filed alphabetically by firm name, and the storekeeper's copy alphabetically by the material.

Requisition to Purchase.—This form is printed in duplicate and numbered consecutively, and is shown by Fig. 3. Requisition may be made on the purchasing department by the storekeeper or by the superintendent when a machine or other special article is required, the original being handed to the purchasing agent and the duplicate retained.

The purchasing department, when ordering from

Requisition on Purchasing Department No. 4313

16738

Date 10/1/13

Order From Pgh Spiral Spring Co
Pgh, Pa.

Ship Via PRR Date Wanted 11/1/13 For Dept. STOCK

Quantity	Description
15,000	Steel Springs 7.2# Compression B. P. #492

Balance on Hand 5,000

Approved

Signed W. Simeon
Storekeeper

Fig. 3—Requisition to Purchase

these requisitions, should always mark the requisition number on the purchase order copies and mark the purchase order number on the requisition. The requisitions are filed numerically under their own number. Should any dispute arise later over any article or material which has been ordered, the authority for same can be found by reference to the requisition on file, the number of which can be found by reference to copy of purchase order.

Receiving Slip. — This form, shown by Fig. 4, is printed in triplicate and is written up by the receiving clerk promptly upon receipt of material. The space "How Received" should show whether material is received by freight or express, and the space "Charges" should show the amount of carrying charges presented by the transportation company. In the event of transportation charges being prepaid the receiving slip should be so marked. The original copy is forwarded to the purchasing department, accompanied by expense bills; it will verify the charges shown on the receiving slips and pass the expense bills promptly to the auditor. The receiving slips are then entered on the purchase record card showing the date, quantity and receiving slip number, after which they are placed temporarily on a Shannon board file in alphabetical order under the name of the shipper.

RECEIVING SLIP № 1693

Date 10/20/13

Received From Pittsburgh Spiral Spring Company,
Pittsburgh, Pa.

How Rec'd FREIGHT Charges PREPAID Order No. 16738

No. Pieces	Description	Weight
15,000	Spiral Steel Springs 7.2# Compression	

Checked by Received by

Fig. 4—Receiving Slip

The duplicate copy is forwarded by the receiving clerk to the inspector along with the material, who upon inspection will signify his approval of the material by attaching his name to this copy, forwarding same, along with material, to the stores department. Thus it will be seen that the duplicate copy of the receiving slip acts as a move order. The quantity shown by the receiving slip should be verified by the stores department before the material is put into its proper place. The quantity is then transcribed on to the material record and the receiving slip filed alphabetically under material classification. The triplicate copy of the receiving slip is retained by the receiving department and filed alphabetically under the name of the shipper.

Invoices.—The invoices when received should go immediately to the proper clerk's desk for checking and posting. A rubber stamp, providing for the check of calculations and prices, receiving slip number and date, freight or express charges, etc., is impressed on each invoice, and after this operation is completed the calculations should be checked. The invoices are then entered on the purchase record card, and should at the same time be checked for price, since the card will show price fixed at the time purchase order was placed, and if not, a comparison may be made by a glance over the card, which gives a complete record of any previous purchases of the same material. After calculations and prices have been checked the invoices are placed on a Shannon board file in alphabetical order under the name of the shipper and are ready to be matched up with the receiving slips.

Both the invoices and receiving slips now being filed in the same alphabetical arrangement, each separately, the process of completing them is simple. The clerk should now proceed with matching up by placing both files on the desk in front of him and going through them from A to Z, posting from receiving slips on to the invoices the transportation charges, receiving slip date and number, after which both are removed from the files. Invoices for which receiving slips are not on file or vice versa should not be removed. After invoices and receiving slips have been matched or completed the invoices should be approved by the purchasing agent, then listed alphabetically and passed to the auditor, a receipt being obtained for them. The receiving slips are retained by the purchasing department and filed numerically. In the event an invoice falls into dispute over prices charged or for any other reason a letter should be written requesting proper adjustment, the invoice being put on the Shannon file, with a copy of the letter attached, awaiting response. Invoices in dispute should never be returned to the supplier for correction, as confusion in the account, through misunderstanding or loss of such invoice, will result in most cases where this is done.

The advantage of handling invoices by the method outlined above is apparent, since they are kept in one place only, where they can be referred to readily. At the same time it minimizes the chances of invoices being mislaid or lost, which will happen frequently when they are thrown loosely into drawers, letter baskets and other receptacles or "catch-alls" about the desk.

Stores Department Material Record.—This record is kept in the stores department and its pur-

MATERIAL RECORD

Material _____ Rough _____ Purchased _____ Re No. _____ Max. Stock _____
Weight _____ Finished _____ Made in this Plant _____ Section No. _____ Min. Stock _____
Quantity to Order _____

Date	Reference	Received	Disbursed	Balance	Date	Reference	Received	Disbursed	Balance	Date	Reference	Received	Disbursed	Balance

Fig. 5—Stores Department Material Record

pose is to keep the storekeeper posted on the exact condition of the stock from day to day. The sheet, shown by Fig. 5, is buff color, size 10 x 12 in., and is punched for a loose leaf binder. The column under the heading "Reference" is for the insertion of receiving slip or in-and-out slip numbers on which material is placed in stock or disbursed. Balances showing material on hand should be brought down when each entry is made and the storekeeper should insist upon entries being made each day.

When fixing the maximum and minimum amount of stock to be carried careful thought should be given to the demand for such material by the factory as shown by past records, also the probable length of time required for the delivery of material by the manufacturer or supplier after the purchase order has been placed. For example, let us take some item which is used in comparatively small quantities and is carried in and purchased from local jobbers' stock; 500 pieces represent one month's supply and may be fixed as the maximum amount to be carried. The material can be procured on one or two days' notice. Therefore, the minimum should be fixed at 125 pieces, or approximately one week's supply. On the other hand, let us take an item which is in great demand by the factory and is regularly purchased from the manufacturer; 50,000 pieces represent two months' supply and may be fixed as the maximum amount to be carried. The manufacturer requires, as shown by past experience, from three to four weeks under normal conditions to prepare the material for shipment, and another week to ten days is required for delivery by freight after shipment is made. In this case the minimum amount of stock to be carried should be fixed at 50,000 pieces, or the same as the maximum. When disbursement entries are being made in the material ledger comparisons should be made so that balances brought down will not be allowed to fall below the minimum before requisitions for additional supply are placed with the purchasing department.

Canada's Large Imports of Iron and Steel

Those From the United States Ten Times Those From Great Britain—The Canadian Industry's Recent Growth Small

BY EDWARD PORRITT

OTTAWA, CANADA, January 30, 1914.—Sir Edmund Walker, president of the Canadian Bank of Commerce, in his address at the annual meeting of the shareholders held in Toronto a week ago, called attention to the fact that Canada is importing iron and steel of the value of $140,000,000 a year, and regretted that the greater part of this material was not made in the Dominion. "While workmen are busily engaged in other things," he continued, "as they have been in Canada, it may be said that they are not available for more work in iron and steel. But as soon as railroad and other building lessens in volume, not in the aggregate, but in proportion to other industries, we may hope that we shall be able to make in Canada the larger part of the iron and steel goods now imported. The increased output of our coal and iron mines, of our blast furnaces, and of our manufactories, which would result, would be of inestimable value to the country as a whole."

IMPORTS FROM UNITED STATES $120,000,000

Since the president of the Bank of Canada made this statement the report of the Department of Trade and Commerce for the fiscal year ended March 31, 1913, has been published. It shows that the total importations for the year are as large as Sir Edmund Walker stated, and that with the exception of $2,123,000 worth—the iron and steel imported from Germany—all this business was divided between the United States and Great Britain. The United States must come first in this enumeration, for its exports of iron and steel to Canada in 1913 were about ten times as large as those from England and Scotland. The total value of these imports from the United States was $120,950,115, of which $14,096,857 represented pig iron, wire rods and other manufacturers' materials on which no duties were paid. It is important to take note of these comparatively large and growing importations of duty-free raw materials, because in respect to them manufacturers in England and Scotland have no advantage under the preferential tariff; moreover, proximity to Canada, plus in many instances similarity of needs, gives American manufacturers considerable advantage in the competition for business.

RAILROAD BUILDING A GREAT STIMULUS

The present enormous demand for manufactures of iron and steel in Canada may be dated from 1906. In that year work was begun on the new transcontinental railway that before 1914 comes to an end will connect Halifax and St. John, via Moncton, with Prince Rupert, British Columbia. The Canadian Northern also began to take shape as a transcontinental line; and the Canadian Pacific began double-tracking between Fort William and Vancouver. The statistics in the new report of the Department of Trade and Commerce do not go as far back as 1906. The earliest year they cover is 1909. In 1909 the importations of iron and steel from the United States and the United Kingdom were of the value of $30,936,592 and $8,403,781 respectively. The United States was then easily in the lead; and notwithstanding the preference, and the enormous increase in the demand in Canada for iron and steel, the lead since then, as the accompanying tables show, has been easily maintained. Only the principal items are given in these tables.

GOVERNMENT AID A LARGE FACTOR

No industry in any country ever received more governmental help than the iron and steel industry in Canada. It has been protected in every tariff since 1879. From 1883 to 1911 it received $17,035,827 in bounties from the Dominion Government, of which $16,785,827 was paid out between 1896 and 1911. Since 1900 railroad companies which receive Dominion subsidies for new lines have been compelled to lay them whenever possible with rails that

have been made in Canada. In the province of Ontario bounties were paid to the industry from 1896 to 1900, and all the large companies that today own iron and steel plants in Nova Scotia and Ontario have received bonuses and exemptions from

Canada's Iron and Steel Imports from Great Britain

	1909	1913
Agricultural implements	$26,461	$79,893
Angles, beams, etc	334,940	334,070
Axles	42,249	33,139
Bars, bands and hoops	268,073	728,185
Bridge material	256,839	487,650
Castings	25,049	100,051
Chains	86,758	109,072
Cutlery	345,693	778,524
Gasoline machines	16,570	83,612
Locomotives	5,847	2,324
Forgings and shaftings	5,995	13,222
Builders' hardware	28,171	112,983
Hoops and bands	35,225	38,389
Ingots, blooms and billets	60,059	57,131
Nails and spikes	3,646	3,055
Pig iron	369,664	828,098
Cast-iron pipe	333,773	768,211
Plates	182,433	34,212
Tubes	164,278	550,702
Rails	315,596	16,565
Fish plates	16,372	599
Railroad spikes	678	570
Switches	9,330	33,240
Scrap	26,086	11,154
Galvanized sheets	697,466	1,716,963
Tin plates and terne plates	323,096	326,332
Sheets and strips	647,232	344,345
Angles, beams and plates	87,312	45,860
Steel for saws	14,836	45,860
Tools and implements	81,149	152,095
Wire rods	217,777	10,074
Wire and manufactures of wire	1,071,708	2,393,342

Imports from the United States

	1909	1913
Agricultural implements	$1,585,350	$4,383,394
Angles, beams, etc.	1,757,724	7,777,910
Axles	54,874	713,848
Bars, bands and hoops	256,265	1,223,864
Bar iron and steel	938,727	3,401,538
Billets	97,793	1,716,530
Bridge material	142,367	822,947
Castings	304,868	1,673,758
Cast scrap iron	142,410	572,179
Chains	230,564	560,409
Chrome steel	13,947	38,566
Cutlery	120,077	301,600
Gasoline engines	705,298	3,162,446
Locomotives	402,231	783,987
Forgings and shaftings	90,581	325,673
Builders' hardware	332,637	832,357
Hoops and bands	239,868	944,548
Ingots, blooms and slabs	3,632	41,758
Locks	212,320	641,550
Typewriters	448,252	1,144,033
Nails and spikes	33,448	164,515
Iron ore	.....	3,326,457
Pig iron	389,383	3,326,457
Cast-iron pipe	36,312	265,215
Pipe fittings	257,095	1,237,517
Steel plates	849,077	3,560,827
Rails	475,837	3,831,200
Fish plates	50,665	87,369
Railroad spikes	33,582	240,684
Switches	65,197	284,063
Railroad tie plates	15,147	21,937
Galvanized sheets	387,752	1,537,464
Tin and terne plates	233,457	582,531
Sheets and strips	467,034	3,052,224
Ship material	42,664	79,863
Stoves	341,841	1,037,016
Tools and implements	788,408	1,424,110
Tubes	788,408	3,490,034
Wire rods	316,741	2,132,014
Wire and manufactures of wire	1,599,853	3,796,000

local taxes from the municipalities. The industry made great progress between 1896 and 1906, when the present great demand for iron and steel began. Before 1896 the only coke furnaces were at Londonderry and New Glasgow, Nova Scotia, and at Hamilton, Ontario. By 1906 four new coke furnaces were in service at Sydney and one at North Sydney, Nova Scotia; one at Sault Ste. Marie and one at Midland, Ontario; and two years earlier—in 1904—the existing rail mills at Sydney and Sault Ste. Marie were at work. Between 1906 and 1913 a fifth furnace was erected at Sydney; two new furnaces were built at Sault Ste. Marie, one at Hamilton, one at Midland, one at Port Arthur, and one at Port Colborne.

HOME CAPACITY FAR FROM ADEQUATE

Yet in no year since 1906 has the capacity of Canadian furnaces and mills been equal to the demand for pig iron and steel rails; while as regards structural steel for use in bridges, office and warehouse building and shipbuilding, there is as yet no mill in Canada at which the heavier descriptions of this material can be made. Wire rods are made at only one mill in Canada, a mill which since June, 1911, when bounties at the rate of $6 a ton ceased to be paid, has been without government aid of any kind. For over two years it has been the only mill at any center of the iron and steel trade that derived no direct benefit from the national policy. As yet Canada has no tin plate mill. A tin plate mill was started at Coburg, Ontario, in 1904, but the manufacture of tin plate was abandoned in 1907 when the Laurier Government refused to put a duty on tin plate or to extend the bounty system to include this infant industry. Factories at which locomotives are made have been greatly extended since 1906. Several railroad car-building companies have also been organized since that time, but as the foregoing tables show, much equipment for Canadian railways is still imported from the United States.

Extensions to the then existing iron and steel plants did not by any means cease when bounties on pig iron and steel ingots came to an end in 1910. Four new furnaces and two new merchant mills have been added to the productive capacity of the Dominion since then, and one new iron company—that at Port Colborne, Ontario—has been organized and now has its furnace in service. But since 1910 not nearly as much new capital has gone into the iron and steel industry as in the three or four years that followed the renewal of the iron and steel bounties by the Laurier Government in 1897.

Ohio Compensation Insurance

An interesting fact in connection with the operation of the Ohio workmen's compensation law, the compulsory features of which went into effect January 1, is that a number of large employers have taken advantage of a clause in the law that permits them to carry their own insurance instead of paying into the State insurance fund the premiums called for in their individual cases.

The law provides that when a company carries its own insurance its payments for injuries or death shall, in amount, be equal to or greater than the amounts paid by the State. A company carrying its own insurance is required to pay into the State insurance fund 5 per cent. of the amount it would pay were its insurance carried by the State. In spite of this compulsory payment, many manufacturers have for various reasons seen fit to carry their own insurance. Of the 307 companies that up to late in January had decided to carry their own insurance, 46 are large concerns.

It is believed that many of the smaller concerns that have started to carry their own insurance will eventually come under the operation of the State law, as they are required to furnish a bond to secure to injured employees the compensation provided for under the act. It is claimed that paying premiums on these bonds makes the insurance considerably higher than if the small companies operate under the State law. Among the larger companies that are carrying their own insurance through mutual benefit funds or by other methods are the Carnegie Steel Company, Youngstown Sheet & Tube Company, Republic Iron & Steel Company, American Steel & Wire Company, American Bridge Company, American Shipbuilding Company, National Cash Register Company and Willys-Overland Automobile Company.

The Jobbing Foundry on Piece Work

The Adaptability of a Definite System of Foundry Operation — Consideration of Factors That Make for Success or Failure

BY ARTHUR J. HOLMES

A wide difference of opinion has always existed, and it is to be presumed always will exist among foundrymen, as to whether castings of the type made by the jobbing foundry can be produced at a lower final cost by working the foundry on a piece-work basis rather than on a straight time or day-work basis, and at the same time produce castings equal in quality. Any foundryman approached on the subject will relate experiences and advance proofs in asserting that one way or the other is the only right way. One man will claim that it is better to have fewer men or gangs, and they, working piece work, produce the equivalent of twice the number of men working day work or time work. Another will assert that although he would employ the larger number of men, and in consequence require more unskilled labor, and more shop room, his day worked product would be superior to that of the piece worked. Anyone desiring to know the better way should undertake the task of ascertaining the true facts by getting right down next to the job himself.

THE DIRECTING HAND

The one great essential to making the piece work basis a success in every way is to have the man in the foundry fair and square, so that while considering the best interests of the firm, he may at the same time treat each workman in such a manner that the continual bickerings so detrimental to the production of good work will be entirely absent. The foundryman, to make this system of working a success, must have had a wide experience, and this experience must have taught him that he must continually have his "eagle eye" open to detect any slighted work. A molder, no matter how high class he may be, will, if not closely watched, finish up a job in such a manner that its shortcomings are not noted until it has passed through the drying ovens and arrives at the assembling or dry floor to be gotten ready to pour. Indeed, it often happens that the defects remain undiscovered until the cleaning department has spent several extra hours on the casting. Costs will show a loss, and the foreman molder is then criticized, and yet a foreman molder with a dozen eyes instead of two could not see everything so surely that nothing could slip through.

One of the impossible things in a jobbing foundry is to place the flasks on a piece-work basis for size. For instance, a tee pipe weighing 500 lb. will require a 36-in. square flask, double drag and double cope, and is worth about 3 hr. molding time. On another floor a scoop for a dredge weighing perhaps 150 lb., and requiring the same size flask, is being made, but owing to the intricate parting, the loose pieces to be "drawn in," and the half dozen or more cores to be set in the green mold, it requires a working time of 10 or 12 hr. Another instance: a hammer block requiring an 8-ft. round flask, 6 ft. high, and weighing perhaps 25,000 lb., can be molded by two men in two days, or a piece work price equivalent to 50 hr. Within a few days the foundry receives a pattern of a cutter head for a suction dredge which weighs only about 2000 lb., but requiring the same size flask, yet the same two molders cannot possibly make the mold in less than a week's time.

SALESMEN SHOULD HAVE FOUNDRY EXPERIENCE

This now brings up the question of selling price, and it is not an extremely bold assertion to make that a very large percentage of the salesmen for the jobbing foundries do not have enough actual knowledge of the workings of the foundry to give them the excuse for posing as salesmen. As an instance of this, a salesman will underbid a competitor on a job that he perhaps does not see the pattern for; he secures the order and the pattern is delivered to the foundry, where the foundryman carefully examines everything. On the latter's learning that the selling price is so and so, he then has to try to devise ways and means to make the best of a bad bargain. He finally advises that he cannot possibly, no matter how he may scheme, break even. Is the order and pattern returned to the customer with the advices that the work cannot be accepted? In ninety-nine cases out of a hundred, no. The foundryman's reputation of being fair and square is then stretched almost to the breaking point, and he finally has to make a piece-work price which when costs are finally totalled up shows a net loss on the order. Yet when the foundryman advised beforehand that the order would show a loss the head office issued instructions to "do the best you can and try to make it up on something else." These "something elses" when finally totalled show only a fair amount of profit, and the month as a whole is such that if it were taken as a criterion, the foundry would need to make an excuse to itself for continuing in operation.

CONSULT THE FOUNDRYMAN

Another bold assertion that might be severely criticized, but nevertheless is only too true, is that the foundryman is not consulted on many questions which would work to the best interests of the firm if he were. The profits are not made in the office, nor the pattern shop, nor the cleaning department, yet the one man who is the prime factor in the success of any foundry doing a jobbing business is not called into consultation once in a dozen cases. Does he know the selling prices? He does not, and yet he is the one who has to make the profits or be the one to stand the blame for the losses and therefore should be one of the executive force, so to speak, instead of an employee in the foundry.

As an illustration: An order is taken for a pump casing for a suction dredge weighing approximately 10 tons, perhaps at a price entirely satisfactory to the sales department. When the pattern is received at the foundry it is discovered to be a skeleton instead of a full pattern. Right at the start the foundryman can immediately foresee that the foundry cost will be high. The pattern requires a 12-ft. square flask. The first problem to solve is how to carry the core, and the only solution is to mold and cast a special core plate. Then along with it, of course, is required several dozen special jet bars to carry the overhanging sand on the inside

of the casing and accordingly these are made. The next delay is the building up of extra sections of flask as the job progresses, each time, of course, causing a stoppage in the molding. Now if there is any foundryman anywhere who could estimate closely enough to set a piece-work price satisfactory to the molders and at the same time cause the order to show a net profit over ordinary expenses plus incidentals, that man would not stay in the foundry long enough to be able to say that he was employed there for a while.

And why isn't the foundryman consulted? A good answer to this question would be that if he should be called into consultation he would raise so many questions that before everything could be finally decided and estimates made, some competitor would have taken the work at an exceedingly low price. Then the sales department asks, "How can they take work at such a low figure?" The foundryman will invariably answer "I don't know," and a large part of the time no one else knows.

THE OTHER DEPARTMENTS ON A PIECE-WORK BASIS

Granting after the arguments, affirmative and negative, have all been heard, that the foundry operated on a piece-work basis is superior to that otherwise operated, we may pass the probing question along to the assembling or casting floor. In many foundries the assembling floor is considered as a part of the molding department, and comes under the same general supervisor. Other foundries have the departments separate, but it has always been the writer's opinion from close observation that the former is the preferable way, because in numerous instances something is given such a start in the foundry that the assembling floor must work hand in hand to make the job a thorough success. If the assembling floor is under a separate department head, the foundryman, instead of ordering the work continued in the manner that he desires, and absolutely overseeing the work himself, can only suggest that the procedure shall be such and such. The assembling floor foreman, being a thoroughly experienced man, of course, has ideas of his own, and if he is in the least of a contrary mind, he may insist on doing the work in his own way. Then, should the work prove defective, the manager has a divided responsibility to contend with, and divided responsibility never made a jobbing foundry highly successful.

Some plants operate their assembling floors on a price-per-heat basis, others on a straight-day-work wage. Both systems may work out successfully, so that it is a hard proposition to assert that one is superior to the other for this department. As an explanation, the die block instance cited above may be mentioned. When the mold was taken out of the drying ovens it required only about 30 min. to assemble ready for pouring and there was the nucleus of a heat. Some days previous to this a large mold of a part for a dredge arrived on the floor, and the cores were so numerous and so intricate that it required about 8 hr. to assemble, and the casting weighed about 4000 lb. Everything considered, the class of work that the assembling floor has to contend with in the ordinary jobbing foundry is such that what may be gained one day will be a shortage the next.

The one real advantage of a piece-work basis in this department is that the gang will get the molds together and get away from the shop in 7 or 8 hr., which then gives the other part of the shop some extra crane service, and in some instances some much-needed room to roll and finish copes in an otherwise crowded foundry.

The next department in line is the cleaning shop. The consensus of opinion of men who have made a careful study of the problem is that except in some special cases it is an utter impossibility to operate a chipping department on a piece-work basis. One case that did prove successful was with a foundry that had a large order of rail joints. The castings were made in a snap flask in the foundry and worked out on such a system that as they arrived at the chipping shop each and every rail joint could be cleaned and gotten ready for shipment with about the same amount of labor expended. The piece-work price to the chipper was such that if any castings had an extra fin or the sand adhered in such a manner as to cause several minutes' extra work the man would likely be short at the end of the day. The foundryman would then be called into consultation and he would devise some scheme to prevent the cause of the extra labor and everything would move smoothly for a short period until some other trouble presented itself. Taken all in all, though, the contract was a success from a piece-work basis viewpoint, but instances like this are rare.

On other classes of work, taken separately piece by piece, this system cannot be worked out satisfactorily. On an order that a foundry received for four large slag pots, the first casting to arrive in the chipping shop was in such condition that nearly every inch of sand had to be chipped off before shipping. Besides this, the fin in several places was exceedingly heavy. The sand adhering so badly might have been caused by any one of a number of faults. The fin might have been blamed either on the molders for "shaving" the joints too much, or on the assembling floor for not having joints thoroughly clamped down. But the point is this, if the chipping shop foreman had agreed to a price on the basis of the time required to clean the first casting, then when the other three arrived with the sand all off before anyone touched the casting, and no fin to require extra work, the firm would have decided right then that the piece-work basis would not work to their advantage in the chipping shop. On the other hand, if the first casting should have been the easily cleaned one, and the others somewhat worse, the chippers having agreed to a price on the basis of the first, would perhaps have resigned their positions rather than work at a loss.

Unique Power Plant for Ford Motor Company

The Ford Motor Company has placed contracts for a gas engine-electric power plant that will be not only one of the largest in the country, but in many respects altogether unique. The company has appropriated in the neighborhood of $1,000,000 for the project, which will put into effect plans Henry Ford has long had in mind for utilizing the waste heat of the ordinary producer gas engine.

Four 6000-hp. Hamilton-Gray gas engines of novel design will drive the same number of Crocker-Wheeler 3750-kw. 250-volt 80 r.p.m. engine-type direct-current generators, but one pair of cylinders will be operated by producer gas and the other by steam. The steam will be generated from the water used in the water jacket of the gas engine, further heated by the exhaust gases and by waste heat from the producer gas plant. This water or steam will be used as the feed water for the boiler which supplies the steam engine cylinders. A heavy flywheel will equalize the characteristics of the gas and steam driven elements of the engine. Each of the generators will have a normal rating of 3750 kw., the largest capacities on record for generators of this type. Each engine will appear as a cross-compound engine with two cylinders in tandem on each side.

The Clinkering of Coal and Its Composition*

The Fusion Temperature Not to Be Judged by the Sulphur or Iron Content—Their Relations Discussed

BY OSCAR W. PALMENBERG †

One of the most troublesome features in the combustion of coal is that due to the production of clinker. This influences the rate of combustion and the cost of maintenance, especially where automatic stokers are in use. A coal may clinker so readily under certain conditions that it becomes unfit for use irrespective of its fuel value. It is therefore of the greatest importance to know whether a coal will clinker under the conditions for which it is required. When coal is burned under a boiler for the production of steam it is especially important to know whether the ash will clinker and at what temperature.

The production of clinker, as is well known, is due to the fact that the ash of the coal, which is the liberated mineral matter, is exposed to a temperature sufficient to fuse it, causing it to form a viscous mass which will flow and form cakes and thereby clog up the spaces between the burning particles of coal or coke. The mass of fused material offers resistance to the flow of air and robs the coal of the necessary oxygen to support combustion. If the draft cannot be increased to overcome this resistance the rate of combustion is diminished, other things being equal, in proportion to the amount of clinker formed.

To determine whether a coal will clinker, that is, whether it has an ash which will fuse at a low temperature, has been undertaken in several ways, and many have been of the opinion that an analysis of the ash or the iron in the ash, or the sulphur in the coal will furnish the explanation.

EFFECT OF SULPHUR AND IRON CONTENT

To show that there is no relation between the clinkering quality of a coal and the sulphur or iron content, the writer has made this investigation, and the following analyses of the ash, together with the fusing temperature determinations on a wide range of coals, will readily show that no conclusion can be obtained from a chemical analysis.

The ash of coal is composed mainly of silica (SiO_2), Iron oxide (Fe_2O_3), aluminium oxide (Al_2O_3), calcium oxide (CaO), magnesium oxide (MgO), sodium oxide (Na_2O), potassium oxide (K_2O), carbonates (CO_2), sulphates (SO_3) and small amounts of phosphates. Since all coals, but particularly soft coals, consist of a mixture of pure coal substance and pyrites, bone, slate, fire-clay, etc., these elements will be present in a variable proportion, depending upon the nature of the coal vein and the method and care by which the coal is extracted from the ground. In making an analysis, therefore, of a coal sample representing a mixture of all these materials a definite percentage of the component parts of the ash may be obtained, but this analysis does not tell us how much pyrites, bone, slate, fire-clay, etc., is present. It is therefore apparently impossible to judge from this analysis whether the ash will have a high or low fusing temperature. It is true that the pyrites will fuse at a lower temperature than the slate, but since both may contain iron, the analysis does not indicate a method of arriving at a conclusion to show the fusibility of the ash due to the iron content. The problem offered is very similar to that of trying to determine a formula by which the heat value in a coal may be estimated. This has been tried by using the percentage of ash and volatile matter or ash and fixed carbon, but since these constituents are so variable in their composition, depending upon their sources, it is impossible to arrive at a reliable formula. For that reason a calorimetric determination must be made.

DEDUCTIONS FROM ANALYSES

The analyses and fusing temperature determinations in Tables 1 and 2 were made on coals most of which were mined in Pennsylvania, and samples were obtained either from the mine or place of consumption.

TABLE 1

Analyses Showing the Composition of the Ash of Bituminous and Semi-Bituminous Coals, Arranged in the Order of the Fusing Temperature of the Ash

No.	Fusing temperature	SiO_2	Fe_2O_3	Al_2O_3	CaO	MgO	K_2O, SO_3, Na_2O, CO_2	Sulphur in the coal	Ash in the coal
1..	2700	51.93	4.81	36.82	3.84	1.00	1.60	.51	5.15
2..	2615	44.74	14.14	36.91	2.18	.41	4.85	1.46	7.88
3..	2400	40.61	22.26	32.94	1.77	.51	1.91	2.06	9.70
4..	2600	48.83	6.28	42.62	1.64	.30	3.90	1.01	9.15
5..	2600	54.18	7.29	34.53	3.01	.47	.52	.90	6.41
6..	2372	30.07	39.88	25.31	2.63	.39	1.71	2.41	8.96
7..	2309	47.94	17.95	28.47	4.17	.51	.96	2.11	11.04
8..	2300	46.40	13.84	35.30	3.58	.31	.57	1.80	13.51
9..	2300	30.90	35.13	31.14	2.00	.52	.31	2.13	6.25
10..	2246	35.48	30.67	30.73	2.10	.44	.28	2.17	7.90
11..	2180	29.37	38.75	29.52	1.57	.37	.44	3.97	10.60

No.	Per cent.		Deg. F.	
2.....	14.14	iron oxide.....	2615	fusing temp.
8.....	13.84	iron oxide.....	2300	fusing temp.
6.....	39.88	iron oxide.....	2372	fusing temp.
11.....	38.75	iron oxide.....	2180	fusing temp.

No.	Deg. F.		Per cent.	
7.....	2309	fusing temp.....	17.95	iron oxide
8.....	2300	fusing temp.....	13.84	iron oxide
9.....	2300	fusing temp.....	35.13	iron oxide
3.....	2400	fusing temp.....	22.26	iron oxide
6.....	2372	fusing temp.....	39.88	iron oxide

It may be noted from these tables that some coals have ash of like iron content and variable fusion temperature; then again, others have ash of like fusion temperature and variable iron content. It would appear from these analyses that there is no relation between the percentage of the various constituents of the ash and the fusing temperature. Therefore a chemical analysis is of no value to arrive at a conclusion regarding the clinkering quality of a coal. It may be noted that although coals having an ash with a very low iron content seem to give the highest fusing ash, no definite fusing temperature fits a definite percentage, and when the iron content goes beyond 10 per cent. the fusion temperature cannot be judged at all. That the sulphur content of the coal has no bearing whatsoever upon the fusibility of the ash is also apparent. The writer intends to continue this investigation on coals from other sources with the object of determining whether there may not be some having practically no iron and showing a low fusing ash.

*A paper read before the Society of Chemical Industry.

†Fuel engineering chemist, New York City.

Since the sulphur occurs in coal combined either with iron, lime or the hydrocarbons, there naturally exist innumerable combinations, and for this reason the sulphur content cannot be used as an index to

TABLE 2

Fusing Temperature of the Ash in Coal Arranged According to the Iron Content of the Ash

No.	Iron oxide	Sulphur in coal	Ash in coal	Fusing temperature	No.	Iron oxide	Sulphur in coal	Ash in coal	Fusing temperature
1..	4.81	.51	5.15	2700	20..	22.57	2.00	9.03	2336
2..	6.28	1.01	9.15	2600	21..	23.17	1.16	9.52	2535
3..	7.29	.90	6.41	2600	22..	23.30	2.40	8.10	2156
4..	7.88	.74	5.57	2600	23..	24.40	2.23	10.90	2190
5..	7.94	1.52	15.61	2750	24..	26.50	2.13	6.86	2192
6..	11.28	1.04	8.53	2745	25..	27.22	3.13	13.54	2138
7..	13.84	1.80	13.51	2300	26..	28.39	1.96	6.65	2084
8..	14.14	1.46	7.88	2615	27..	28.81	2.32	7.55	2318
9..	15.15	1.07	6.38	2560	28..	30.67	2.17	7.90	2246
10..	15.21	1.42	7.98	2400	29..	33.27	2.86	9.33	2520
11..	15.38	1.57	....	2156	30..	35.13	2.13	6.25	2300
12..	16.00	1.63	9.90	2309	31..	36.12	3.04	8.40	**2264**
13..	17.43	....	7.98	2516	32..	36.17	2.60	7.50	2500
14..	17.95	2.11	11.04	2309	33..	38.75	3.97	10.60	2180
15..	19.19	1.79	7.90	2138	34..	39.51	2.97	8.22	2210
16..	19.54	2.41	11.33	2380	35..	39.88	2.41	8.96	2372
17..	22.26	2.06	9.70	2400	36..	40.93	2.68	9.08	2415
18..	22.26	1.90	7.23	2372	37..	44.00	4.12	....	2246
19..	22.38	2.56	....	2210	38..	44.39	3.51	9.34	2318

No.	Per cent.		Deg. F.	
9	15.15	iron oxide	2560	fusion temp.
10	15.21	iron oxide	2400	fusion temp.
11	15.38	iron oxide	2156	fusion temp.
21	23.17	iron oxide	2535	fusion temp.
22	23.30	iron oxide	2156	fusion temp.
31	36.12	iron oxide	2264	fusion temp.
32	36.17	iron oxide	2500	fusion temp.

No.	Deg. F.		Per cent.	
11	2196	fusion temp.	15.38	iron oxide
23	2180	fusion temp.	38.75	iron oxide
16	2380	fusion temp.	19.54	iron oxide
35	2372	fusion temp.	39.88	iron oxide
13	2516	fusion temp.	17.43	iron oxide
32	2500	fusion temp.	36.17	iron oxide
15	2156	fusion temp.	19.19	iron oxide
25	2138	fusion temp.	27.22	iron oxide

clinkering. Only in those cases in which the sulphur is in combination with the iron in the form of pyrites would it be possible to judge the clinkering property, if the iron content in the ash had any bearing upon the fusion temperature.

FUSION DETERMINATION MORE VITAL THAN SULPHUR

The fusion temperature determination of the ash in coal will in the future displace the sulphur determination in such coals used for steaming purposes, and will readily show the fallacy of buying and selling coal on an analysis basis where specifications are used containing sulphur tables penalizing beyond a certain guaranteed amount of sulphur.

It has been quite a common practice to place 1.50 per cent. sulphur as a limit and penalizing as much as 4c. per ton for every 0.25 per cent. above 1.50 per cent. The injustice of this practice is very evident, as it often happens that coals with a high sulphur content are extremely high in heat value and do not clinker readily at all. Since the sulphur has no appreciable effect upon the metallic parts of the furnace it need therefore not be considered in the selection of a coal for steaming purposes.

To arrive at the value of a coal for steaming purposes it is therefore just as essential to make the fusion test of the ash as it is to make the calorimetric determination. If these determinations are made, an explanation is readily had why two coals of apparently like proximate analyses will give entirely different evaporation when fired under like conditions.

The L. S. Starrett Company, Athol, Mass., is issuing a unique button featuring the safety movement. The button, which is of celluoid, bears the solid red circular sign of the movement with the words "Safety First" across it. At the top is a reproduction of the company's trademark, and at the bottom, along the edge, is the inscription "Then Starrett Tools."

New Departure Company Makes Changes

The New Departure Mfg. Company, Bristol, Conn., will shortly occupy a large new administration building, which has been in course of erection for the past twelve months. It is 62 x 220 ft., 6 stories, including the basement, is fireproof and otherwise modern in every detail. Great care was used in designing to insure a building that would be handsome as well as practicable in every way.

The office is located on the fifth floor. An electric elevator enables it to be easily reached. At the front and south side of this floor are located the private offices of the officials and heads of departments. The partitions between the general office are of plate glass above the mahogany wainscot. The floor is tile. At the west side is a double fire and burglar-proof vault of 2 stories. A feature of the main office is the large leaded glass dome ceiling light, 16 x 112 ft., supported on pilaster columns. The colors in the dome are opalescent greens and ambers, which catch and diffuse the sun's rays without causing shadows. On this floor, in addition to the general office, is a large foremen's conference room, with a small kitchen attached, equipped for serving luncheons. All office furnishings are mahogany, and the workers in each department are immediately opposite the private office of the head of that department. The remainder of the building will be occupied principally in the inspecting and assembling of the company's product. The first floor will be given over entirely to shipping and receiving.

Something like 25 years ago the New Departure Mfg. Company started business in a small room containing less than 60 sq. ft., and to-day it is occupying nearly that many square acres, employs 2000 skilled mechanics and is one of the most thoroughly equipped manufacturing plants in America. One entire building is devoted exclusively to the scientific study and analysis of steel and manufacturing processes. This building is equipped with modern chemical, metallurgical, and physical testing laboratories. The growth of the company in the past few years made it necessary to frequently provide large additions to its manufacturing facilities. Its demand for ball bearings grew so fast that it could not wait to build necessary additions and bought out the plant of the Whitlock Coil Pipe Company, Hartford, comprising 145,000 sq. ft. of floor space. It was not long before still further additions became imperative; office quarters also became insufficient and the building just completed was planned.

Beginning January 1 Albert F. Rockwell, who was one of the founders of the company, and who developed the patents covering the company's product, was relieved of certain managerial details, but continues his duties as president. De Witt Page, who has also been identified with the company almost from its inception and in later years as secretary, sales manager, purchasing agent and advertising manager, has been appointed general manager. Charles T. Treadway, who for some years has been treasurer of the company, continues in that capacity, but also becomes chairman of the board of directors.

The melting points of some refractory oxides have been determined by C. W. Kanolt, of the Bureau of Standards, Washington, as follows, platinum with a melting point of 1755 deg. C. being determined as a check: Magnesium oxide (MgO), 2800 deg. C.; calcium oxide (CaO), 2572 deg. C.; aluminum oxide (Al_2O_3), 2050 deg. C.; chromium oxide (Cr_2O_3), 1900 deg. C.

Phosphorus Determination in Steel and Iron

Standardizing Solutions with Materials of Known Phosphorus Content Discouraged —The Impurities of Yellow Precipitates

BY L. SELMI AND W. H. WHITFIELD*

It is a common practice among iron chemists to standardize the alkalimetric solution for phosphorus determination by the aid of standard material of known phosphorus content. The reason for this and for the fact that no attention is paid to the reactions involved in this alkalimetric method is probably not familiar to all chemists. We therefore hope that the description of what we have done along this line in our laboratory may not be amiss.

The Handy or alkalimetric method is based on the following reaction:

$$2[(NH_4)_3 12\ MoO_3PO_4] + 46NaOH + H_2O = 2[(NH_4)_2HPO_4] + (NH_4)_2 + MoO_4 + 23Na_2MoO_4 + 23H_2O$$

But many an iron chemist has tried and failed to make his work check with the theoretical phosphorus as figured from the above reaction. The commonly accepted method of standardizing the alkali solution with standard material is obviously risky, since a mistake, made in running the standard, would prove a costly one. Also, the iron chemist severs his connection with the theory of chemistry to fall into pure empirism.

We made a stock alkali solution and matched it with a nitric acid solution of exactly the same strength. We determined the normal factor of our soda solution by titrating it against a hydrochloric acid standard, 0.271 normal. The normal factor on the hydrochloric acid had been previously determined very accurately. Our soda solution came out 0.195 normal, and this normal factor was checked also by titrating with known amounts of oxalic acid for standardizing. One cubic centimeter of soda solution of this strength, according to the reaction as shown above, is equivalent to 0.0002628 g. of phosphorus; that is to say, 19.2 c.cm. of such a soda solution would be required to neutralize the yellow precipitate derived from 2.628 g. of the cast iron, standard "C" (Bureau of Standards), whose phosphorus is given as 0.192 per cent.

We weighed six different portions, 2.628 g. of standard "C," and dissolved them with 100 c.cm. of 1.13 sp. gr. nitric acid. After solution was complete we filtered and washed. To the filtrate and washing we added 10 c.cm. of potassium permanganate (30 g. per liter and boiled again for 10 min. The manganese precipitate was then reduced with ferrous ammonium sulphate, free from phosphorus, and boiled again for 10 min. We cooled and added 20 c.cm. of ammonia and brought to 85 deg. C., and precipitated with 50 c.cm. of molybdate solution. Before adding the molybdate, in some instances we added a few drops of nitric acid to bring the iron solution to the amber color desired. The yellow precipitate was allowed to settle one hour and then filtered and washed, first with 1 per cent. nitric acid and last with 1 per cent. potassium nitrate. The washing with 1 per cent. nitric acid was done on a filter paper eight times in each of the six determinations. In the six determinations we obtained the following results:

21.1 c.cm.	21.3 c.cm.
21.2 c.cm	21.2 c.cm.
21.2 c.cm.	21.2 c.cm.

This would give for standard "C" 0.212 per cent. phosphorus, as against the true phosphorus of 0.192 per cent. We realized that the cause of this discrepancy was due to some impurity which entered in a constant proportion in the yellow precipitate, as this was obtained under exactly the same conditions and treated likewise in each determination. To prove that this impurity was iron, after titration we acidified the residue in the flask with HCl and boiled, then neutralized with ammonia and filtered and washed thoroughly with water. Then a weak solution of warm HCl was poured on the filter paper and received into a solution of potassium ferrocyanide, when an intense Prussian blue color developed as an indication that appreciable quantities of iron were carried along with the yellow precipitate in each determination. From material varying in phosphorus content we precipitated yellow phosphomolybdate amounting to from 0.1 to 0.5 g. and subjected the same to a very thorough washing with 1 per cent. nitric acid solution. In some instances the washing was prolonged up to 50 times, and after titration with a soda solution we treated the residue in the above described manner for the detection of iron, and invariably Prussian blue coloration was obtained. This proved to us that the last traces of iron cannot be washed out from the yellow precipitate with 1 per cent. nitric acid.

We next precipitated yellow phosphomolybdate from chemically pure sodium phosphate, and reprecipitated the same and washed it thoroughly with nitric acid. We dried it at 100 deg. C. to constant weight, and portions of ½ g. and 1 g. were titrated against our soda solution, obtaining the following results: For 0.5 g. 31 c.cm. of soda and for 1 g. 62 c.cm. of soda were used up. This gives 0.0002629 as the phosphorus value per cubic centimeter of our soda solution, which value checks almost exactly with the value derived from the reaction as stated above. We next precipitated from the Bureau of Standard "C" about 4 g. of yellow precipitate and washed this thoroughly with 1 per cent. nitric acid and dried it at 100 deg. C. to a constant weight. Portions of this precipitate titrated against our soda gave the following results:

0.5 g.	34.50 c.cm.
0.5 g.	34.40 c.cm.
0.5 g.	34.50 c.cm.
1.0 g.	69.00 c.cm.

From these results the phosphorus value of our solution is 0.0002362. We then weighed six portions of 2.362 g. of standard "C" and determined the phosphorus by using exactly the method outlined above, and on these six determinations we obtained a phosphorus percentage of

0.192	0.190
0.195	0.192
0.189	0.194

These results are a close check on standard "C." It is needless to say, in every one of the last six determinations referred to, we detected appreciable quantities of iron as carried over with the yellow precipitate.

Finally we ran four determinations on standard

*Lake Superior Iron & Chemical Company, Ashland, Wis.

"C," taking 2.628 g. of the standard for each determination, and the yellow precipitate obtained from these, after washing with nitric acid solution, we dissolved with dilute ammonia and reprecipitated the same. This second precipitate, washed eight times with nitric acid solution and four or five times with potassium nitrate solution, was titrated with our soda, obtaining the following results:

19.00 c.cm.	19.40 c.cm.
19.10 c.cm.	19.20 c.cm.

These are a close check with the phosphorus 0.192 per cent., as given for cast-iron standard "C."

In conclusion we may say:

That the general practice of washing seven or eight times the yellow precipitate with 1 per cent. nitric acid is not sufficient to remove all of the iron, and even after washing 40 or 50 times appreciable quantities of iron are retained by the yellow precipitate.

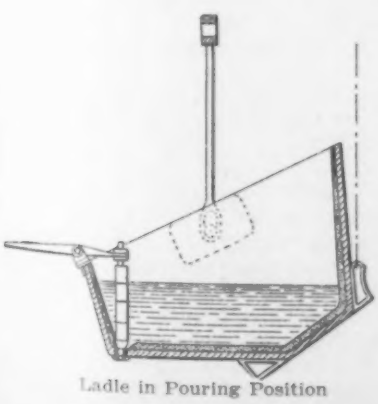
That systematically conducted analyses may give accurate results, inasmuch as it appears that the same quantity of iron impurities is contained in each case.

That standardizing a solution by the aid of phosphorus standards is to be relied upon only when the routine material is of approximately the same phosphorus content as the standard, and the routine work is run exactly the same as the standard.

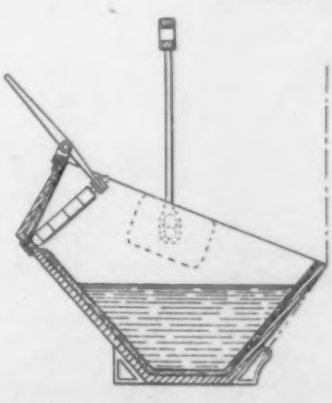
That a solution can be standardized strictly by making use of the reaction involved, and made to correspond with any standard phosphorus material, provided the yellow precipitate is purified by reprecipitation, as otherwise iron impurities will cling to it and cannot be washed out.

A New Ladle for Steel

In pouring steel from a ladle it not infrequently happens that the stopper sleeves and plug are burned off by the hot metal, with the result either of allowing considerable steel to be lost or of making it difficult or impossible to draw the stopper. Sometimes the metal chills and solidifies around the nozzle, causing considerable loss. The object of a patent (1,084,914—January 20, 1914) granted to Samuel T. Wellman is to do away with these difficulties. A ladle, hung from trunnions at its sides, is provided with means for limiting the downward movement of the rear end of the ladle, and having its nozzle arranged at the front end in such a position that when the rear end is depressed in what may be called its carrying position, the nozzle is wholly above the fluid metal. For pouring, the ladle is elevated on one side so as to submerge the stopper, it being so situated in the pouring position that it is at the lowest point of the ladle and completely submerged.



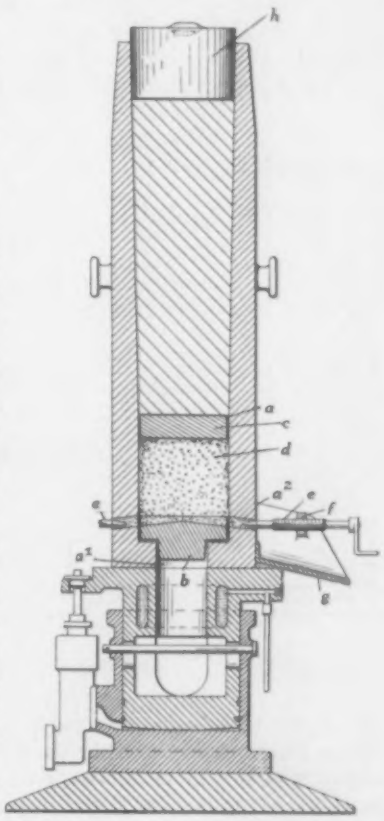
Ladle in Pouring Position



Ladle in Carrying Position

Sound Ingots by Jarring

The proposal to produce sound ingots by jarring has developed certain difficulties which it is the object of a patent (1,081,997—December 23, 1913) granted to S. T. Wellman, Cleveland, Ohio, to overcome. In carrying out the invention a tapered mold is used, having its upper end largest, with preferably vertical side walls from the point *a* downward, as shown in the illustration. There is a hole a^1 in the bottom of the mold, covered with a bottom plate *b*. The primary features are that the mold is partly filled by dry, free-flowing sand *d*, which rests on the plate *b*, and in turn supports the plate *c*; in the lower end of the mold there is an opening a^2, or several of them, through which this sand may slowly flow out. A conical pointed valve *e* screws through a lug *f* fixed to the side of a sand delivery spout *g*. The purpose of the plate *c* is to keep the metal from direct contact with the sand, and of the bottom plate *b* to afford a convenient means by which the solidified ingot may be forced out.



Apparatus for Jarring Ingot Molds

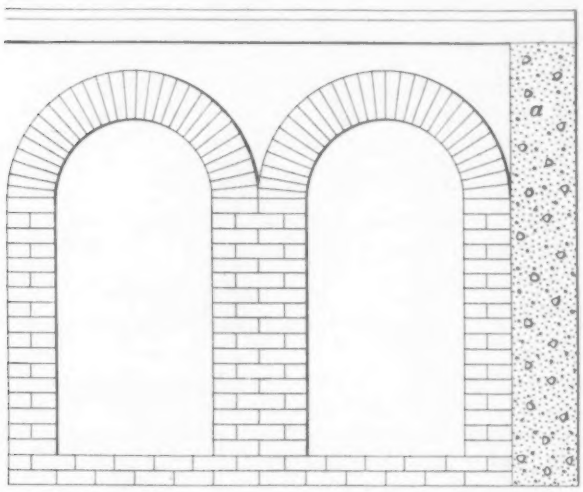
While the metal is solidifying and being jarred the sand is allowed to flow out at such a rate as will allow the shrinking ingot shell to settle down and maintain contact with the side walls, thus being sufficiently compressed laterally to force the still fluid and pasty metal upward, filling what might otherwise become a permanent pipe and preventing the cracking of the mold. A heavy weight *h* at the top resting on the metal has been found of advantage.

The total shipments of anthracite from Pennsylvania for 1913, according to final figures, were 69,069,628 tons. This is 5,459,050 tons more than in 1912, when production was curtailed by a suspension in the spring while a new agreement was being negotiated with the miners. The 1913 output, however, is 884,669 tons less than in 1911, which was the record year.

The Whiting Foundry Equipment Company, Harvey, Ill., has arranged with S. R. Vanderbeck, 217 Walnut street, Philadelphia, Pa., to handle its complete line in the Philadelphia territory. He also represents in that territory the Atlas Car & Mfg. Company, Cleveland, Ohio; Orton & Steinbrenner, Chicago, locomotive cranes and grab buckets, and the New Jersey Foundry & Machine Company, Coburn track, etc.

Failure of a Heat-Exposed Concrete Wall

The failure of a 20-in. concrete wall due to heat action recently occurred in the open-hearth plant of an Eastern steel mill. This wall, which served the double purpose of a retaining wall and a support for the charging floor, was at the end of the cellar and adjacent to the wall of the furnace regenerator, the two walls being fastened together by a film of fire



Sketch Showing the Location of a 20-In. Concrete Wall in an Open-Hearth Plant Which Failed as a Result of Heat Action

clay. The location of the concrete wall is indicated in the accompanying drawing by the letter *a*.

On tearing out the furnace for rebuilding, it was discovered that the heat from the regenerator had penetrated the entire thickness of the concrete and caused the whole mass to disintegrate to a soft, chalky substance which broke up easily under a hammer. In making the concrete the cement apparently had been combined with the aggregate to form a substance similar to limestone, and the disintegration had therefore taken place by a process similar to that in a limekiln. In rebuilding the concrete wall was replaced by one made of used firebrick. This type of wall has been in use in this plant under similar conditions and is expected to stand up without deterioration.

Electrical Control System for Panama Locks

The locks of the Isthmian Canal will be completely operated and controlled by electricity. A control board, which is an operating miniature of the locks themselves with indicating devices to show the positions of the various chains, lock gates and valves, and the water level in the different lock chambers, is housed in a control house centrally located on the middle wall at each flight of locks. This apparatus was manufactured by the General Electric Company, under specifications prepared by the Isthmian Canal Commission. The indications as a general thing will be synchronous with the movement of the lock machinery and the proper sequence of operation will be insured by complete interlocking.

While the control houses are located to give a good view of the locks, this is not depended upon. The indicator for the mitering gates consists of a pair of aluminum leaves, shaped to conform to the top view of the gates and swinging back into recesses as the gates do. The chain fender indicators are small aluminum chains which lower into slots in the control board. A small aluminum cage behind a glass front is used to indicate the position of each lock valve. The water level indicators are mounted in tall cases with graduated fronts, and are accurate within 1/20 ft. A coarse index giving a rough indication and a fine one showing the fractions are used in this connection. The position of the miter forcing machines are shown by colored lights.

The control board for the Miraflores locks is 52 ft., while those at Gatun and Pedro Miguel are 64 and 36 ft. long respectively. Each is 32 in. high and 54 in. wide. Cast-iron plates are used to represent the side and center walls of the locks and extend the length of the board, while blue Vermont marble slabs are used for the water in the locks. The sides are removable steel plates. The control switches which operate through 90 deg. have name plates for the open, closed and off positions.

Elevated Tanks for Fire Protection

The need of more care in the design and construction of elevated tanks for fire protection systems was brought out in a paper by W. O. Teague, engineer and inspector, Associated Factory Mutual Fire Insurance Companies, presented at the annual meeting of the American Society of Mechanical Engineers, held in New York City in December. The precautions to be observed in the design and construction of wooden and steel tanks were taken up at length, together with details of the foundations and towers in connection with them. The elevated or gravity tank for fire protection systems was first made of wood, but there are now as many being made of steel. Wooden tanks have been built up to 100,000-gal. capacity, although they are rarely larger than 60,000 gal., for above this capacity the steel tank is cheaper and more practicable. The cost of a 60,000-gal. tank of wood or steel erected on a 75-ft. steel tower is about $3000. Steel tanks are built in large sizes, one of the largest being of 1,200,000-gal. capacity; this one is 50 ft. in diameter and 90 ft. high, and is supported by a steel tower 130 ft. high.

Many serious failures of tanks have been traced to weakening of the flat hoops by their rusting at the back where they bore against the staves, due to moisture from rain being retained between the surfaces of the hoop and staves. The use of hoops of round rod without welds has remedied this trouble as their surface is nearly all exposed for inspection and painting, and also they are not so subject to corrosion since the exposed surface of a round rod is much less than that of a flat bar or band of the same cross-sectional area. The use of round rod hoops permits of a satisfactory connection to the lugs, now made of malleable iron. The hoops are so placed on the tank that the lugs do not come in a vertical line.

Important Find of British Iron Ore

At the recent annual meeting of the Millom & Askam Hematite Iron Company, Ltd., Cumberland, England, G. Mure Ritchie, chairman, told of iron ore discoveries made at Ullbank, which he said were probably the most important development in the history of the company. The ore was found 1000 ft. below the surface and was a single body containing millions of tons, high in iron, low in silica and remarkably free from phosphorus and sulphur. With the exception of Hodbarrow, the discoveries at Ullbank are said to be the largest deposit of hematite ore found in the history of iron mining in Cumberland. They will make the company entirely independent of the iron ore market.

TESTS OF BRAKE EFFICIENCY*

The Coefficient of Friction for Shoes on Chilled and Steel Carwheels Compared

The coefficient of friction between the brakeshoe and a moving wheel, which is the measure of brake efficiency, is a variable quantity depending upon the speed and kind of wheel, the shoe pressure, the length of time the shoe is applied, the kind of shoe, whether plain, chilled or with inserts, the kind and shape of inserts, condition of shoe, etc. The coefficients of friction for a large variety of brake shoes under varying conditions have been determined at Purdue University in a series of tests conducted for the Master Car Builders' Association, and supplementary tests were also made for the Association of Manufacturers of Chilled Car Wheels.

For the original test 28 brakeshoes of various kinds were selected, two of each, and one set was submitted for tests in the laboratory of the university and the other was tested on the brakeshoe testing machine of the American Brake Shoe & Foundry Company, Mahwah, N. J. The coefficient of friction was determined on a chilled iron wheel in effecting stops from an initial speed of 40 miles per hr. under three different brakeshoe pressures, 2808, 4152 and 6840 lb. On a steel wheel the coefficients were determined at the three pressures for chilled wheels, and in addition at ones of 10,000, 12,000, 15,000 and 18,000 lb., effecting stops from an initial speed of 65 miles.

The particular point brought out in these tests was the greater coefficient of friction on the chilled iron wheel. The results obtained with one particular kind of shoe were very consistent and the results obtained from the tests of the shoe on chilled iron wheels, with stops made from speeds corresponding to 40 miles per hr., and also on the steel wheel at 40, 65 and 80 miles per hr., are reproduced in the accompanying drawing. From this diagram it is evident that there is a dropping off in the coefficient of friction in brakeshoes as the pressure increases. The rate of decrease amounts to about 6 per cent. of the coefficient of friction for each increase of 1000 lb. pressure. This drop is constant within the limits of these tests and holds true for both the chilled iron and the steel wheel.

It is also evident that there is a dropping off of the coefficient of friction, as the velocity of the wheel increases. It is therefore self-evident that the retarding force is not proportional to the braking power or shoe pressure, but in general terms for pressures between 2000 and 15,000 lb. per shoe the amount of work increasing with one-half the rapidity that the shoe pressure increases, or doubling the shoe pressure will increase the retarding effect 50 per cent. At very low and very high pressures the work accomplished increases in a very much lower ratio. In the case of the shoe referred to, on a chilled iron wheel, at a constant speed of 20 miles per hr., the coefficient of friction at 800-lb. pressure was 44 per cent., and at 2000-lb. pressure 26.3 per cent. The retarding force at 800 lb. was 352 lb., while at 2000-lb. pressure the retarding was 526 lb. This shows that for an increase in shoe pressure of 150 per cent. the work done increased but 50 per cent. This shows the advantage of the small continuous pressure as compared with heavy intermittent pressure in controlling trains on heavy grades.

As the majority of tests on the steel wheel have been made at high speeds and those on the chilled iron wheel at 40 miles per hr. and less, a direct comparison of the effect of speed on the coefficient of friction is not as clearly worked out as would be

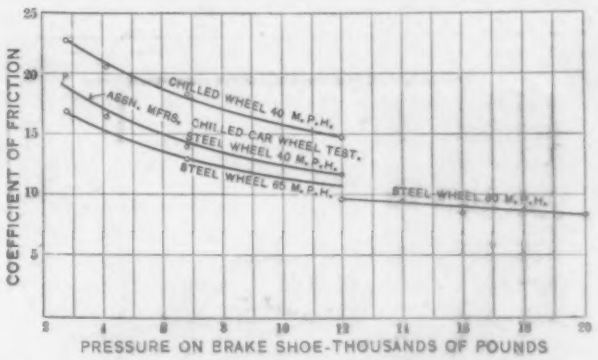


Diagram Showing the Results of a Series of Tests to Determine the Coefficient of Friction for Brakeshoes in Making Stops from Various Initial Speeds of Chilled and Steel Wheels

desirable. However, there is sufficient data to indicate the probable effect through a range of from 40 to 80 miles per hr. and this was brought out in the accompanying drawing. Under heavier pressures the effect of speed is not as noticeable as at lower ones. The probability is that after reaching 12,000-lb. pressure the speed effect is very largely eliminated, whereas at the lower pressure the effect of increasing speeds is a very material reduction in the coefficient of friction.

The question is frequently raised as to whether the brake efficiency of chilled iron wheels is equal to that of steel wheels. The indication is very strong in all the tests made that not only is the brake efficiency of the chilled iron wheel equal to that of the steel wheel, but as a matter of fact it is about 25 per cent. higher. According to the drawing, the coefficients of friction are easily 25 per cent. in favor of the chilled iron wheel in stops made from an initial speed of 40 miles per hr.

*From a paper prepared for the Association of Manufacturers of Chilled Iron Car Wheels by S. K. Vial, chief engineer, Griffin Wheel Company, Chicago.

Milwaukee Metal Trades and Founders

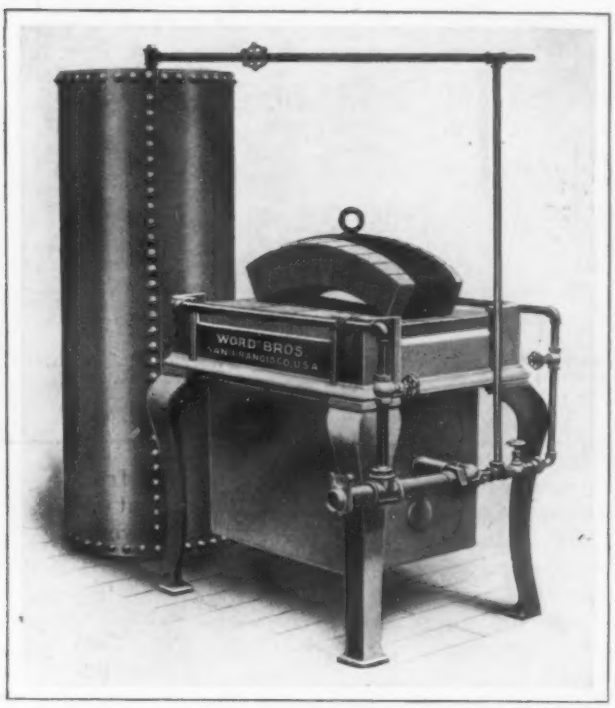
Dr. William J. H. Boetcker, Toledo, Ohio, was the principal speaker at the banquet which followed the annual meeting of the Milwaukee Metal Trades and Founders' Association in the Hotel Pfister, Milwaukee, Wis., on January 29. He decried the destructive policies of political, social and labor agitators and reformers of the present day, who apparently are doing their utmost to prevent employer and employee from getting together for common good, and delight in tearing down rather than building up. William H. Barr, president National Founders' Association, was present and discussed general trade conditions. Theodore Vilter, president Vilter Mfg. Company, acted as toastmaster. It was the largest and most interesting meeting the association has yet held.

Officers were elected as follows: President, Theodore Vilter, Vilter Mfg. Company; vice-president, Henry Harnischfeger, Pawling & Harnischfeger Company; secretary-treasurer, William J. Fairbairn, manager Milwaukee Metal Trades and Founders' Bureau. Directors, foundry section, 2 years, Max W. Babb, Allis-Chalmers Mfg. Company; 3 years, Ernst Kastner, B. Hoffman Mfg. Company; machine shop section, 3 years, Clarence R. Falk, Falk Company.

The John S. Oram Company, Cleveland, Ohio, has been incorporated with a capital stock of $60,000, to manufacture cooperage machinery. This company will carry on the business now conducted under the name of John S. Oram.

A Fuel Oil Rock Drill Heating Forge

For heating rock drills especially and also for general blacksmith work, an improved forge using oil for fuel has been brought out by Word Bros.,



A Forge for Heating Rock Drills and General Blacksmith Work Using Fuel Oil

San Francisco, Cal. It operates on the high and low pressure air system, in which the fuel is atomized under high pressure and then delivered to the flame with a liberal supply of air at low pressure. Both heavy and light oils are burned and an increase in efficiency of from 40 to 50 per cent. is claimed as compared with the old way.

In the accompanying cut the forge is shown arranged for general blacksmithing work where only welding heats are required, but it is pointed out that it can be changed quickly for heating drill steel or for other purposes where a steady and uniform heat is desired without disturbing the firebrick lining. The forge is provided with a burner, a 120-gal. oil tank and the necessary connections. The shipping weight of the forge complete with the oil tank is 1600 lb.

Portable Device for Loading Trucks With Sand

For cutting down the time required to load motor trucks with stone, coal, sand, gravel, etc., the Link-Belt Company, Philadelphia, Pa., has brought out a portable loading outfit. It consists of a bucket elevator mounted on large wheels and driven by an electric motor or gasoline engine. The truck driver trims the load on the truck with a shovel and one, two or three men, according to the nature of the material being handled, feed the elevator buckets. With this arrangement it is said to be possible to load a truck at the rate of 1 ton per min. at a cost of 2½ to 5 cents, crushed stone being the most expensive and coal the least, with sand and gravel following in order. In this way a saving of approximately 6 cents per ton is effected.

In addition to this arrangement, a truck with the elevator mounted on the rear end of the body is also supplied, which can be arranged to lower into a storage pile when the truck is backed up to it, and can be raised clear of the ground when not in use. The elevator is supported independently of the dumping body and is driven through a clutch from the truck transmission. With this combination it is possible to load the truck in a few minutes with or without a helper, and the services of a loader-operator who is idle between trucks are dispensed with.

Reciprocating Thread Rolling Machine

The Waterbury Farrel Foundry & Machine Company, Waterbury, Conn., has brought out a reciprocating machine for rolling threads in very small screws. It is equipped with an automatic feed and has a capacity for blanks up to an approximate diameter of 1/16 in. The hopper, feed and feeding parts are designed to allow handling short shank work to better advantage than is possible in the larger machines made by the company, and the pick-up blades have a groove or channel cut along their tops instead of a slot.

The feed chute is agitated by a vibrator to assist gravity in feeding the blanks. There is a pusher or starting slide at the bottom of the chute which takes the blanks one at a time and transfers them to a position between the dies at the proper moment. To prevent the very short blank from being displaced during this transfer a special finger ar-

A Reciprocating Screw Thread Rolling Machine Equipped with an Automatic Feed

rangement is provided on the pusher. A number of tests of the machine have been made to prove its adaptability for handling small screw blanks rapidly.

In 1913 vanadium steel was specified for over 1100 locomotives built in this country and Canada, practically all heavy engines weighing 225,000 lb. and over. This represents 48 per cent. of last year's locomotives of this class. It means an increase of 500 locomotives, or 83 per cent., as compared with the engines built in 1912 which had any vanadium steel parts.

A Stamped Steel Rim Foundry Riddle

The American Implement Company, Waterbury, Conn., has placed on the market a foundry riddle with a truss-like stamped rim of No. 22 gauge steel. One of the features is a broad handhold on the bottom edge of the rim. There is the customary clearance of 7/8 in. for the fingers of the operator under the mesh. It is emphasized that when the riddle is rapped on a bench to clean a clogged mesh, the mesh is tightened by the force of the impact. The construction, it is pointed out, imparts rigidity to the riddle and prevents the sides from collapsing. The rivets employed in the construction of the riddle are put in place electrically. The mesh is inserted and pressed into the holding device by an automatic machine which exerts a pressure of 20,000 lb. Steel, galvanized and brass wires are used for the mesh.

A New Foundry Riddle with an All-Steel Stamped Rim

Purifying Steel with a Special Slag

It is known that silicates of iron and manganese are formed in steel when ferromanganese and ferrosilicon are added to deoxidize the metal. Part of these are retained in suspension and their association with the steel is a mechanical one like that of small pebbles in a mass of clay, plainly visible under the microscope. The presence of these impurities is the cause of many defects found in finished steel, especially Bessemer rails. A patent (1,081,532) for removing these impurities and purifying the steel has been granted to Ernest Humbert, South Chicago, Ill. He claims their practical elimination, after the steel is finished in the usual ways, by the use of a special slag. This slag, which may be called a silico-calcium-carbide, is placed in the finishing ladle in a liquid form and steel from converter or furnace is poured upon it. It contains 10 to 30 per cent. silica, 5 to 50 per cent. calcium carbide and the remainder is lime. It is easily fusible and remains liquid for a long time in the ladle, thus effecting a thorough purification. The silicate of iron and manganese in the steel, on coming in contact with this slag in the ladle, is reduced to manganese and iron, the oxide of carbon escaping according to the reaction:

$$N(SiO_2.MnO.FeO) + N(SiO_2.\ CaO.CaC_2) = N(SiO_2.CaO) + Mn + Fe + CO$$

The reaction is instantaneous. The silicate of lime formed is very fusible and floats on top of the ladle with the necessary excess of the new slag. The slag is made by melting a mixture of silica sand (10 to 30 per cent.), lime (70 to 90 per cent.) and adding carbon in the form of coke or otherwise (10 to 30 per cent. of the total lime and silica).

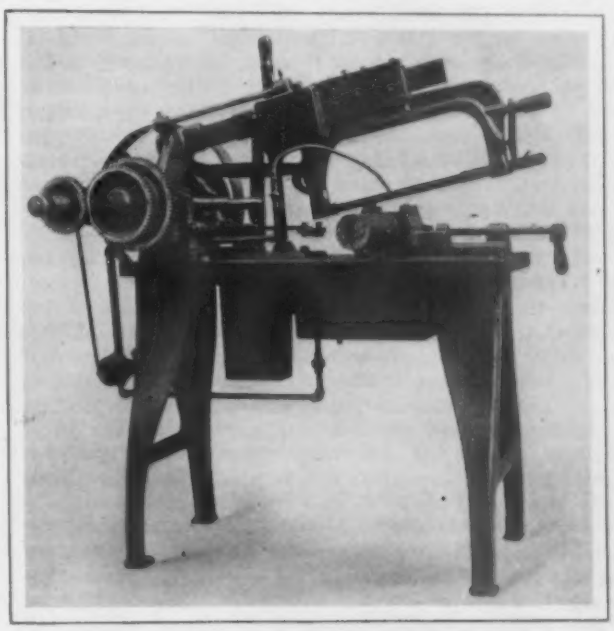
The scarcity of pig iron in Russia is again being so acutely felt by consumers that the subject will shortly be brought before the Duma. The orders received by the Russian Prodamet amounted to 1,918,399 tons in the first 10 months of 1913 as compared with 1,547,616 tons for the same period of 1912 and 1,499,253 tons to November 1, 1911. The only solution, according to a member of the Duma, appears to lie in the authorization for several years of the importation of pig iron at a reduced rate. A bill for this reduction is to be introduced in the near future.

Two-Speed Power Metal Sawing Machine

The No. 5 Economy power sawing machine of the W. Robertson Foundry & Machine Company, Buffalo, N. Y., which was illustrated in *The Iron Age*, August 1, 1912, is now being equipped with a two-speed mechanism designed to give the proper speeds for cutting tool and soft steels and thus secure a maximum amount of service from the blades This size of saw has a capacity for handling work up to 8 x 15 in. and the speed mechanism is furnished on the No. 4 machine which has a capacity for stock 8 in. square and on the larger sizes which are built for handling work up to 20 x 24 in.

The two speeds are obtained through a set of gears. A twin gear having 70 and 72 teeth is mounted on the crankshaft and meshes with two separate pinions on the driving shaft. These pinions have 30 and 35 teeth respectively. The driving pulley, which is mounted on the opposite end of the shaft has a speed of 180 r.p.m., thus giving a frame speed of 90 strokes. The pinions have steel jaws, into which corresponding jaws located on a sliding collar between the pinions, engage. This collar is engaged with either of the pinions by a pull knob at the end of the shaft, the change being secured instantly.

In a test made of this machine 51 steel gear blanks or over 570 sq. in. of cutting were cut in 10 hr., with two blades. In another 43 cuts were taken off a 12-in. 33-lb. beam in 10 hr. at an approximate cost of 7 cents per cut for time and blades.



A Recently Developed Power Machine for Sawing Metal equipped with a Gear Arrangement for Varying the Cutting Speed

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Suit to test the constitutionality of the act of 1913 placing a tax of two and a half per cent. ad valorem on all anthracite coal prepared for market in Pennsylvania has been brought in the Dauphin County court at Harrisburg, Pa., which has jurisdiction in State cases. The suit was brought by the People's Coal Company, Scranton, Pa., which contends that it is in violation of the constitutional provision protecting property from arbitrary measures and that it is a special commodities tax. An attack is also made on the proposed distribution of the proceeds as 50 per cent. of the income is to be retained by the State and the balance apportioned among coal-producing counties for partition among their subdivisions on a basis of population.

The Machinery Markets

Indications of a gradual but steady improvement are apparent in all sections of the country, increased inquiries in particular being a cause for encouragement despite the fact that no heavy sales have been made in any quarter. In New York some firms had a good week, inquiries are fair and there is promise of business from two or three railroads. January was irregular in Philadelphia, but there was some fair transactions and improvement is noted, especially in the volume of inquiry. Cleveland has better prospects for a good volume of small orders than has existed for some time. Actual business is slow in Cincinnati, but there is an improvement in the number of inquiries coming from both the domestic and foreign trade. Detroit has no complaint to make of the volume of trade in January and the slight change of the last week has been for the better. In Chicago dealers are stocking up in preparation for a good year. January showed a slight gain in Milwaukee and the outlook is encouraging. The Central South considers January satisfactory, while there is greater confidence and building is becoming more active. St. Louis has seen a gradual increase in the volume of buying. Feeling in Birmingham is cheerful and the trade there is looking forward to extensive railroad building in Alabama which will create demand. Texas shows a gradual but steady improvement. In the Pacific Northwest the lumber mills are getting into full swing and in some sections it is believed that every mill will be in full operation before March 1 and these conditions, together with prospects of greater trade with Alaska and the Orient, make the outlook brighter.

New York

NEW YORK, February 4, 1914.

While one or two dealers had a fairly good week, conditions changed but little with most of the trade, many possible purchasers persisting in their policy of waiting, some of them saying that they want to see their own business improve before taking any new machinery. There is coming to the surface a limited amount of demand for shop equipment from a few railroads. The Union Pacific has a list of a few tools before the trade and at least two other roads are known to have urgent needs and to be considering purchasing. This buying will not be heavy, as may be expected under the circumstances, but it is at least encouraging. Another good omen is the continuance of inquiry in fair volume. Second-hand stock continues to sell in a fair way.

A dispatch from Washington states that the Bureau of Steam Engineering of the Navy Department has acquired the designs of and license to manufacture the Nuremburg type of Diesel engine, having paid $32,098 for them. Other types were available for purchase, but would have cost much more, some of those interested in Diesel engines wanting almost the entire appropriation of $250,000 for the plans they would supply. The present intention of the Navy Department is that these internal combustion engines will be made at the New York navy yard.

The Central Hygienic Artificial Ice Company, Brooklyn, N. Y., is planning a two-story brick and concrete ice plant, 100 x 180 ft., to be erected on Atlantic avenue between Grand and Classon avenues. The cost will be about $150,000. Address Joseph Cook, president, 543 Madison street, Brooklyn.

The Hinckley Fibre Company, Hinckley, N. Y., has placed a $250,000 issue of bonds and will use the proceeds for extensions and betterments. William A. Stuart, of Cincinnati, Ohio, has been elected president and Newton J. Catro of Dayton, Ohio, vice-president.

The Whale Creek Iron Works, contractor and manufacturer of ironwork for buildings, Calyer and Moultrie streets, Brooklyn, N. Y., will locate on Huron street. Equipment and power requirements have been filled. Address William K. Ross.

The plant of the Paragon Plaster Company, Syracuse, N. Y., was damaged to the extent of about $6000 by fire on January 14. Some conveyors, elevators, etc., were destroyed, but the fire did not affect the big units of the plant, which will be in full operation by February 20. Address W. K. Squier, secretary, treasurer and manager.

The Advance Mfg. Company, Erie, Pa., has taken out a permit for an addition to its plant to be 50 x 180 ft., two stories, which will about double the capacity of the company.

Articles of incorporation have been filed by the Hospital Appliance Company, Albany, for the manufacture of beds, stretchers, hospital appliances, foundry and factory supplies, heavy hardware, etc. The capital stock is $100,000; incorporators, R. R. Schleicher, Troy, N. Y.; G. I. Schleicher, Albany, and R. A. Stevens, Upper Troy.

The Ward Motor Vehicle Company, Mt. Vernon, N. Y., has plans in preparation for an automobile factory. Charles A. Ward, Concord avenue and 143d street, New York City, is president. Lawrence Barnard, New Rochelle, N. Y., is the architect.

The Cathcart Paper Company, North Hoosick, N. Y., has been incorporated with a capital stock of $200,000, and will build a plant for the manufacture of paper of all kinds. J. M. Cathcart, North Hoosick, N. Y., W. B. Cathcart and F. S. Thaler, Brooklyn, N. Y., are the directors.

The Corning Glass Works, Corning, N. Y., is completing plans for a potash factory, 30 x 40 ft., two stories, and a mixing building, 40 x 80 ft., two stories, which it will add to its plant. R. H. Canfield is superintendent.

The Eastern Ore Corporation, Pawling, N. Y., has been incorporated with a capital stock of $700,000 for the treatment of ores and the manufacture of chemicals and by-products. L. A. Hall, Hartford, Conn., O. W. Davis and B. G. Oppenheim, New York City, are the incorporators.

The Thomas Ryan Brewing Company, Syracuse, N. Y., will make extensive additions to its plant and equipment on land recently purchased adjoining its present site on McBrittie street.

The Utica Plumbing Supply Company, Utica, N. Y., has been incorporated with capital stock of $100,000 to manufacture and deal in plumbers', tinners' and steamfitters' supplies. G. D. Donahoe, Johnstown, N. Y.; W. M. Cort and R. A. Tate, of Utica, N. Y., are the incorporators. A manufacturing plant will be established.

The Beverwick Brewing Company, Albany, will remodel its malt house and build a brick and steel refrigerating and cold storage plant.

Waterworks and a sewerage system are to be constructed at Wappingers Falls, N. Y., at a cost of about $75,000 from plans of L. S. Sterling, engineer, Newburg, N. Y. Frank Hasbrook is village clerk of Wappingers Falls.

The National Brewing Company, Syracuse, N. Y., is building a three-story addition to its brewery.

The United Royalties Corporation, Penn Yan, N. Y., has been incorporated with a capital stock of $150,000 to manufacture and deal in patented specialties. L. Bordwell and A. P. Perkins, New York City, and J. S. Bradley, Ridgewood, N. J., are interested.

Bids are being received by M. T. Reynolds, architect, Albany, for an industrial building, 110 x 230 ft., four stories, and a power house, 60 x 60 ft., to be erected at an estimated cost of $125,000 by an association of the citizens of Albany, of which Peter D. Kierman, 100 State street, is chairman.

Sealed proposals are being received by the water

commissioners, Williamson, N. Y., until February 11 for construction of a waterworks system, including pumping station, etc.

Incorporation papers have been filed by the S. W. Wood Engine Company, Clyde, N. Y. H. I. & R. G. Wood and J. E. McGinnis are directors. The company, which will manufacture engines and machinery, is capitalized at $45,000.

Bids are being taken for a two-story and basement factory to be erected at 72 Spring street, Rochester, N. Y., by Henry Swift, manufacturer of gold leaf.

The Buffalo Slag Company, Buffalo, has been incorporated with a capital stock of $50,000 to manufacture concrete and kindred products from slag. L. Beechly, Toledo, Ohio; C. O. Snyder, Bloomville, Ohio, and H. N. Snyder, Buffalo, are the incorporators.

The board of water and light commissioners, Wellsville, N. Y., is having plans for a municipal water works and pumping station prepared by Charles C. Hopkins, consulting engineer, Rochester. The cost of the works will be about $175,000.

The Paragon Plaster Company, Syracuse, N. Y., is remodelling and extending its factory on West Lafayette street, 50 x 110 ft., two stories.

The Doenitz-Paterson Box Company, Buffalo, has filed articles of incorporation with a capital stock of $30,000 to manufacture jewelry cases and boxes. F. F. and E. M. Doenitz and E. S. and J. H. Paterson are the incorporators. Arrangements are being made for the equipment of a factory.

The Keery Chemical Company, Hancock, N. Y., is having plans prepared for an acid factory to be erected early next spring. W. J. Mervin is general manager.

The New York Mackintosh Company, Mamaroneck, N. Y., J. Place, manager, is taking bids for the erection of a rubber factory, 52 x 102 ft., two stories, which it will erect early next spring.

An addition is to be made to the municipal lighting plant at Jamestown, N. Y. The new building will be 61 x 62 ft., 30 ft. high, one story. C. O. Johnson is superintendent.

The Lestershire Publishing House, M. Tyler, president, is taking bids for a building, 80 x 132 ft., one story, for its printing plant.

Philadelphia

PHILADELPHIA, PA., February 2, 1914.

Business the past month was generally spotty and irregular and the bulk of the business of small character. A few machine tool makers received fair orders, little of the business however originating in this immediate district. Toward the close of January inquiries showed improvement, both in number and character. The trade is encouraged with the outlook and better sales are expected to develop the current month. Railway buying of tools continues unimportant. Quiet conditions prevail in the second-hand tool and machinery trades. Power equipment is in fair demand. Irregular requirements for castings is reported by both steel and iron foundries.

E. Allen Wilson, of this city, is preparing preliminary plans for a three-story and basement building, 60 x 150 ft., of slow-burning construction, to be erected in Chester, Pa., the owner's name being, at present, withheld.

John Blood & Co., Inc., dyers, are considering the erection of a one-story dye house, 40 x 135 ft., to be built at Clearfield and Witte streets. Plans are private.

Mahlon H. Dickinson, engineer, is reported to be preparing plans and specifications for a four-story factory building, 60 x 255 ft., of the slow-burning construction type, to be erected at 206-8-10 South Twenty-fourth street, for Joseph H. Greenburg.

The David Berg Distilling Company is taking estimates from plans by Anderson & Haupt, engineers, for a one-story brick and concrete boiler house, 40 x 50 ft., to be erected at Swanson & Tasker streets.

Fink & Seidel, contractors, Colonial Trust Building, Reading, Pa., are taking bids on a three-story factory building, 40 x 120 ft., of slow-burning construction, to be erected in that city, for private parties. Details are not available.

Proposals are being received by Kleeman & Fowler, architects and engineers, Trenton, N. J., for a four-story department store building, 60 x 165 ft., and a one-story garage building, 21 x 47 ft., to be erected in Trenton, N. J., for H. M. Voorhees & Brothers, 109 East State street. Specifications call for metal lath, metal windows, elevators, etc.

The Myerstown Foundry & Mfg. Company, Myerstown, Pa., is making application for a charter under the Pennsylvania laws for the purpose of engaging in the manufacture of iron and steel, etc. Leighton F. Krum, Edward S. Karnitz and Frank Lutz are the incorporators. It is understood that the company proposes to operate the old Stoever Foundry & Machine Company plant.

Bids will be received until February 9 by G. W. Norris, director of the department of docks, Philadelphia, Pa., for furnishing a three-ton electric locomotive crane and electric hoist.

Chicago

CHICAGO, ILL., February 2, 1914.

The willingness to prepare for a year of good business has been an important factor in the movement of machinery in January. The increase in business reflects not so much a greater activity upon the past of users of machinery in securing new equipment as it does the buying by distributors for stock. Such purchases have been a feature in the situation and have been the source of welcome business from the machine tool builder's standpoint. The disposition to look forward with cheerfulness particularly in the direction of the Chicago territory as a market for manufactured products is also suggested by the numerous inquiries reported of eastern manufacturers who are seeking available sites for Chicago manufacturing branches. In contrast the amount of new construction and the number of new organizations in the metal working arts are unusually limited. The new plant to be built at Chicago by the W. A. Jones Foundry & Machine Company, for which ground is to be broken at the earliest possible date, is an important instance of new plant capacity definitely under way. Railroad buying of machine tools continues exceedingly light and with the exception of the Illinois Central business, which is reported still unplaced, the market presents no immediate prospect for such business.

The Continental Can Company, Chicago, has taken out a permit providing for the erection of an addition to its factory and warehouse at 4533 West Grand avenue, of one and two stories, the cost of the improvement to be $75,000.

The H. L. Winslow Company, Chicago, is figuring on machinery valued at $75,000, to be furnished the county boards of Muscatine and Louisa counties, with headquarters at Columbus Junction, Iowa.

The Chicago, Burlington & Quincy Railroad, in connection with the improvements in its yards and shops at Aurora, is about to build a roundhouse at Eola, about five miles east of that city, with capacity for 100 engines.

The City Council of Moline, Ill., is receiving bids and specifications for a 10,000 gal. waterworks pump. Commissioner L. O. Jahns has the matter in charge.

The Schafer Saddlery Company, Decatur, Ind., has been incorporated with $75,000 capital stock, to manufacture harness. The directors are F. Schafer, G. C. Schafer and L. C. Waring.

The Pioneer Mfg. Company has been organized at Loma, Ill., by W. L. McLaughlin, consulting engineer, and associates and will build a foundry and machine shops at Bentley, Ill., where it will have its headquarters after March 1. The company will manufacture a steam turbine which it is developing, boilers, pumps, dredges and automatic machinery for the fusing of sand into brick, stone, tile and sewer pipe. The company advises that it will be in the market for a cupola, boilers, engines, boring machines, planers, lathes, drill presses, punches, shears and all other equipment necessary for an efficient foundry and machine shop.

The Aluminum Ore Company, East St. Louis, Ill., has begun the construction of a six-story addition to its plant for which an expenditure of $150,000 is planned. A boiler house will be built and equipped at a cost approximating $50,000.

The Murray Iron Works, Burlington, Iowa, has recently had a heavy export business, especially to South America, Australia and Canada. A shipment to Shanghai, China, included a 18 x 72 in. high pressure boiler, 16 x 36 in. Corliss engine, together with auxiliary pumps and heaters.

Milwaukee

MILWAUKEE, WIS., February 2, 1914.

January business shows a slight gain over each of the last three months of 1913, and the second month opens with an increased degree of confidence on the part of metal tradesmen in this district that a resumption of normal conditions is close at hand. As reported from other districts of the country, second-hand or used machinery business is brisk, many requirements which ordinarily would call for new machinery being now filled with used material. This is a decided contrast with a year ago, when it was common among tool users to dispose of machinery after short use and purchase new material to get the benefit of improvements and the evident advantage of using brand new tools.

Kirchoff & Rose, architects, Milwaukee, are awarding contracts for a one-story machine shop, 50 x 120 ft., of reinforced concrete, to be erected for the T. S. Wheel & Mfg. Company, Chicago, Ill., on Packard avenue, Cudahy, Milwaukee county.

The James Mfg. Company, Fort Atkinson, Wis., manufacturing steel stanchions and farm stable equipment, will build a $20,000 addition in the spring. The building will be of reinforced concrete, 132 x 154 ft. and one and two stories. W. D. James is general manager.

The William Rahr Sons Company, Manitowoc, Wis., awarded the general contract for a $100,000 addition to its malting plant to Paul Heisen Son Company, Manitowoc. The Dornfeld system of pneumatic drum malting will be installed. The building will be of brick, steel and concrete, 80 x 200 ft., 60 to 80 ft.

The Complete Mfg. Company, Kenosha, Wis., has been incorporated with a capital stock of $10,000, to engage in a general mechanical manufacturing and repair business and develop inventions and designs by Fred J. Fischer, Bruce V. Piper and Joseph R. Clarkson. Negotiations for leasing a shop are under way.

The Northern Paper Company, Green Bay, has decided on the construction of a three-story building, 80 x 160 ft., to be equipped with an 118-in. Fourdrinier paper-making machine. The hydroelectric power plant will be enlarged to care for the increased demand. John C. Fogarty is general manager.

The Plymouth Foundry & Machine Company, Plymouth, Wis., has increased its capital stock from $30,000 to $65,000, to extend its activities and provide additional manufacturing facilities.

The United Refrigerator & Ice Machine Company, Kenosha, Wis., has been awarded a $25,000 contract calling for the complete equipment of the public market building at Little Rock, Ark. Direct artificial refrigeration will be used.

H. F. and P. B. Brown, of Eau Claire, Wis., have purchased the plant and business of the United Electric Motor Company, Menomonie, Wis., which has been idle for several months, and will resume the production of small electric motors and farm lighting equipment. The firm is styled Brown Bros.

The Stevens Point Brewing Company, Stevens Point, Wis., decided at its annual meeting to build a new bottling and pasteurizing plant, office building, and increase the power-producing capacity. The work will cost $25,000. N. Gross is secretary.

The Lauson-Lawton Company, DePere, Wis., manufacturer of stationary and portable gasoline engines, is preparing for a large production of small electric lighting plants for farm home, power boat and other similar purposes. The company has booked several important contracts from Porto Rico and Cuba.

The Hausmann Bros. Brewing Company, Madison, Wis., has purchased the Sommers tract in Park View for $20,000 and will devote it to extensions of the brewing and malting plant. Part of the work will be done this year.

The Storle Engine Company, Kewaunee, organized with $50,000 capital, has taken over the plant of the Storle Valve Mfg. Company at Kewaunee and will engage at once in the production of internal combustion engines of the rotary valve type for farm and automobile use. The company has purchased the Ziemer foundry plant at sheriff's sale and will remodel and enlarge it for its purposes. O. O. Storle, head of the new company, established the valve factory about two years ago and the change is due to the evolution of his designs and inventions in the engine field.

The I. B. Rowell Company, Waukesha, Wis., manufacturer of farm implements, has increased its capital stock from $100,000 to $200,000 and will build a new foundry, 100 x 215 ft., with a capacity three times the present facilities. Work will begin at once.

The Lincoln Box Company, Merrill, Wis., whose incorporation to manufacture veneer products was recently noted, advises that it will build a plant 80 x 100 ft. with a boiler house 30 x 40 ft. and a dry kiln 20 x 40 ft. John G. Wendel is president and George Misterek secretary and treasurer.

Detroit

DETROIT, MICH., February 2, 1914.

While January was not a busy month in the local machinery market, a good volume of business was transacted and dealers generally were not inclined to complain. What change has been noted the past week has been for the better; sales showed a slight increase and the number of inquiries is encouraging. The demand for second hand tools continues fairly good. There is a brisk demand for boilers and engines, and there is a steady movement in electrical equipment of the smaller type. The foundry trade continues dull. Building conditions show no change, but contractors are looking forward to an early resumption of activity.

The village of Highland Park, Detroit suburb, at a special election January 24 voted to issue bonds to the amount of $450,000 to build a waterworks system independent of Detroit, with a pumping station on Lake St. Clair. The initial equipment will consist of two pumps and a great amount of pipe and miscellaneous equipment. Donald Thompson is president of the village.

The R-C-H Corporation, Detroit, has been organized to take over and operate the manufacturing and service departments of the company of the same name whose assets were recently sold at receiver's sale. The plant of the old company will be used by the reorganization, of which Charles P. Sieder is the head.

Jacob Shevits, Detroit, has awarded contracts for the construction of a two-story brick manufacturing building at Hastings and East Lafayette streets.

The Grand Rapids Hand Screw Company, Grand Rapids, Mich., has been incorporated with $200,000 capital stock to manufacture a line of manual training school equipment. A large factory has been acquired. George W. Fortier, P. B. Schravesande and W. B. Matheson are among those interested.

The Grand Rapids Paint & Specialty Company, Grand Rapids, has been incorporated with $10,000 capital stock to manufacture paint specialties.

The Bay City Tool & Machine Company, Bay City, Mich., has been reorganized under the style of the Bay City Dredge Company, following the completion of its new plant, and will enlarge its operations. George D. Jackson is president, S. C. Crump, treasurer, and W. S. Ramsay, formerly of the Industrial Works, Bay City, secretary and general manager.

The Charter Land Company, Grand Rapids, Mich., will erect a pumping station in connection with its development of suburban property near Grand Rapids.

The Towar Wayne County Creamery Company, Detroit, is projecting the establishment of three milk condensing plants at up-state points, to cost $50,000 each. Locations are not yet definitely settled.

The plant of the Munising Paper Company, Munising, Mich., was damaged by fire January 21 to the extent of $50,000.

The American Box Board Company and the American Paper Box Company, both of Grand Rapids, Mich., and the Illinois-Michigan Fiber Box Company, Battle Creek, Mich., have effected a merger. The new company, which will be known as the American Box Board Company, is capitalized at $1,500,000. A new factory building will be erected.

Cleveland

CLEVELAND, OHIO, February 2, 1914.

There is more business in prospect than for some time in single tool and small-lot orders, and this indicates a more active market this month than in January. Considerable inquiry of this character came out during the week, but not much business was placed. In actual volume of business placed conditions improved during the latter part of January, but as yet there is practically no inquiry for lots of more than two or three machines. The outlook, however, is better. Some new manufacturing enterprises that have been held back until conditions improve now show indications of going ahead, and these will require a fair amount of machinery equipment. The inquiry for second-hand machinery is fairly active, but at present there is a great deal on the market. Small power plant equipment is in moderate demand. In the jobbing foundry trade little improvement is noted in the demand.

The Richard Automobile Company, recently incorporated with a capital stock of $250,000, will establish an assembling plant in Cleveland for the manufacture of automobiles. Among those interested in the company are Francois Richard and F. M. Brady, of the Cleveland Brick & Clay Company. A temporary office has been established at the office of the latter company, 1032 Engineers' Building.

The Monarch Brass Company, Cleveland, Ohio, maker of plumbers' brass goods, has increased its capital stock from $20,000 to $60,000.

The Cleveland City Forge & Iron Company, Cleveland, has commenced the erection of a new structural steel building, to be occupied as a forge shop. This will replace the present forge-shop building.

The Lanken-Vivian Company, Cleveland, has been organized with a capital stock of $35,000 by J. J. Lanken and James C. Vivian to manufacture paints and varnishes. It will make a specialty of paints for structural steel, ships and general uses of the metal trades. The company has established a plant at 2091 East Nineteenth street.

The Eagle Nut & Bolt Company, Cleveland, has been incorporated with a capital stock of $35,000 by W. C. McCullough, L. J. Mittinger, W. F. Young and others, to manufacture nuts and bolts.

The Firestone Tire & Rubber Company, Akron, Ohio, is in the market for a 26-in. drill and a key seater.

Cutlery specialties of various kinds and manicuring articles will be manufactured by the H. Clauss Cutlery Company, Fremont, Ohio, and has been incorporated with a capital stock of $50,000 by Henry Clauss, John M. Sherman and others. The company will establish a plant in the building formerly occupied by the Fremont Mitten & Glove Company.

The Kehnlein Ice & Storage Company, Bellaire, Ohio, which has recently incorporated with a capital stock of $150,000 is planning the erection of an ice-making plant with a 60-ton capacity.

The Norton Motor Plow Company, Galion, Ohio, has been incorporated with a capital stock of $300,000 by R. A. Norton, B. L. Sites, A. W. Lewis, G. W. Nickels and others.

The Hardin Wyandotte Lighting Company, Kenton, Ohio, will remodel its lighting plant and install some new equipment.

The Rex Machine Company, Mount Vernon, Ohio, has been incorporated with a capital stock of $15,000 by Romeo Williamson, Charles G. Tigner and others, to manufacture glass-making machinery.

Wheeling

WHEELING, W. VA., February 2, 1914.

The West Virginia Electric & Traction Company plans improvements to its electric plant at Morgantown, W. Va., which will increase its capacity 40 per cent. A. N. Dutton, of Wheeling, W. Va., is general manager.

The Donovan Boiler Works, Parkersburg, W. Va., is having plans prepared for an addition, 50 x 100 ft., which will double the capacity of the plant.

George Dieringer, architect, Wheeling, W. Va., is drawing plans for a factory building to be erected in Glendale, W. Va., for the Wheeling Metal & Mfg. Company, which will be devoted to the manufacture of patented metal shingles.

The Mannington Glass Company has been organized to build a glass plant at Mannington, W. Va. Plans have been drawn for a plant costing $76,390. Dr. W. J. Leahy, of Mannington, W. Va., is president.

The Berkeley Buggy Company, Martinsburg, W. Va., has been incorporated with a capital stock of $25,000 to manufacture vehicles. The incorporators are D. W. Shaffer, Ray Barney, Paul H. Miller and others, of Martinsburg, W. Va.

The Lamp Oil Company, Parkersburg, W. Va., has been incorporated with $50,000 capital stock by J. H. Otey, W. J. Dent, W. H. Miller and others, of Parkersburg, W. Va.

The stockholders of the Wheeling Mold & Foundry Company at their annual meeting in Wheeling, W. Va., voted to increase the capital stock from $750,000 to $1,000,000 and to increase the par value of the stock from $50 to $100. W. E. Stone and H. E. Fields were added to the directorate.

Enslow, Anderson & Brode, Huntington, W. Va., who purchased the Hecla holdings of 13,400 acres near Ironton, Ohio, at receiver's sale, will develop the lands at once. New coal mines will be opened and clay property will be developed.

The Concrete Steel Bridge Company, Clarksburg, W. Va., has been incorporated with a capital stock of $25,000 to manufacture material and construct bridges of concrete and steel. The incorporators are Frank D. McEnteer, T. W. Horner, J. D. McManaway and others, Clarksburg, W. Va.

The Busy Oil Company, Fairmont, W. Va., has been incorporated with $25,000 capital stock by F. M. Murchy, A. M. Kuhn, Joseph I. Michaels and others, Fairmont, W. Va.

The R. W. Stone Contracting Company, Huntington, W. Va., was incorporated with $10,000 capital stock by R. W. Stone, of Stone, Ky.; Z. Groseclose, of Williamson, W. Va., and others.

The J. H. Sykes Lumber Company, of Philadelphia, Pa., was incorporated by W. P. Wilson, A. A. Wilson, Henry M. Russell and others, of Wheeling, W. Va.

The plant of the Morgan Lumber Company, Charleston, W. Va., was completely destroyed by fire, with a loss of $100,000.

The Cumberland Campbell Coal & Coke Company, Welch, W. Va., has been incorporated with $25,000 capital stock by James P. Flanagan, of Welch, W. Va.; Eli L. Glade, of Chicago, Ill., and others.

The Huntington Gas & Development Company, of Huntington, W. Va., has plans under way for putting up a $250,000 gas pumping station.

The Midgeley Tire & Rubber Company, Columbus, Ohio, has been incorporated with $550,000 capital stock by A. C. Lewis, Thomas C. Jones, J. Oscar Naylo, and others, of Steubenville, Ohio.

The Biddle Coal & Coke Company, Uniontown, Pa., has been incorporated with $250,000 capital stock by John T. Robinson, John E. Hess, John D. Carr, and others.

The Charles W. Boldt Glass Company, now building a plant at Huntington, W. Va., for the manufacture of flint glass products, expects to get it in operation by August 1. Thomas H. Morris is manager.

The Modoc Coal Mining Company, Bramwell, W. Va., has been incorporated with $100,000 capital stock by J. J. Huddleston, of Algoma, W. Va., W. H. Thomas, and others, Bramwell.

Cincinnati

CINCINNATI, OHIO, February 2, 1914.

Some improvement in the inquiry for machine tools appears, but actual business is slow in developing. The railroads are doing no buying and there is practically no demand for machinery of any kind from the automobile manufacturers. The export business begins to show some improvement, and several orders were received last week, among them one for several lathes to be shipped to Japan. The outlook for electrical equipment is somewhat better and several large deals are pending in the South. All of the jobbing foundries are operating on short time. Wood-working machinery is in better demand, and the export business in this particular line is said to be very good for this season.

Local machine tool builders are much interested in the outcome of bids submitted to the Board of Education, Springfield, Ohio, covering about 21 machines of different kinds. It is now rumored that a still further extension of time will be made on about half of this equipment.

It is reported that the Crescent Motor Company, Carthage, Cincinnati, Ohio, is arranging for adding to its manufacturing facilities, for which considerable machinery equipment will be required. This company recently acquired the plant of the defunct Ohio Motor Car Company.

The Eagle Bottling Works, now located at Urbana, Ohio, contemplates building a large plant at Carthage, Ohio, a Cincinnati suburb. In case this move is made the Urbana plant will probably be abandoned.

The Columbus Collar Pad Company, Columbus, Ohio, recently formed by J. F. and E. B. Hatcher, has acquired a plant already in operation, to which extensions are contemplated. Very little machinery equipment will be required.

The Guernsey Earthenware Company, Cambridge, Ohio, contemplates making a large addition to its plant. Details as to the equipment required are not available.

The Gem City Machine Company, Dayton, Ohio, will rebuild its plant that was recently destroyed by fire.

The Pillings & Noyes Company, Dayton, Ohio, manufacturer of automatic typewriters, machinery models, etc., suffered fire loss estimated at $10,000, covered by insurance. Considerable new machinery and tools will be required.

The G. W. Bobb Company, Columbus, Ohio, will build a four-story garage and wholesale building, 112 x 160 ft. A small repair shop will be operated in connection with the garage.

New electrical machinery will be required by the municipality of Loudonville, Ohio. R. F. Andress is mayor.

The Morton Motor Plow Company, Galion, Ohio, has been incorporated with $300,000 capital stock to manufacture farm machinery. R. A. Morton is the principal incorporator.

The Lawter Tractor Company, St. Marys, Ohio, has been incorporated with $125,000 capital stock by L. G. Neely and others. Manufacturing plans of this company were mentioned some time ago.

The Central South

LOUISVILLE, KY., February 2, 1914.

January was a satisfactory month with local machinery manufacturers and dealers. The volume of business was considerably greater than expected. Greater confidence pervades and this is being evidenced in numerous improvements and enlargements. The building situation looks particularly good. Architects report that many important plans held over from last year are now likely to be made effective. There is a good call for electrical equipment of all kinds. Boiler shops are working closer to capacity than for some time past. Wood-working operations are livening up and taking care of additional machinery.

The C. C. Mengel & Bros. Company, Louisville, said to be the largest mahogany manufacturer in the country, is planning the construction and equipment of a reinforced concrete sawmill in Louisville in 1914. The plan was taken up last year, but was not carried out. C. R. Mengel is president of the company.

The Louisville Veneer Mills is in the market for a number of bandsaws. Other equipment will probably be needed. H. E. Kline is superintendent.

The James Clark, Jr., Electric Company, Louisville, has sold a 250-kw. generator to the Standard Sanitary Mfg. Company for installation in its Pittsburgh plant. The generator will be direct connected to a Skinner engine.

Armour & Co. have decided to reconstruct the refrigerating plant of their Louisville branch and will begin work shortly. The changes will involve an expenditure of $50,000. W. A. Calloway is the Louisville manager.

The Zapp & Short Company, Louisville, grocers, will install a motor-driven ice machine. Arthur Zapp is manager.

The Princeton Light & Power Company, Princeton, Ky., expects to buy a 150-hp. horizontal tubular boiler. A 100-kw. alternator is also wanted. W. J. Holman is superintendent.

G. W. Newman and Fred Alsip, Hawesville, Ky., will open a coal mine shortly, and will be in the market for the necessary power, conveying and mining machinery.

W. J. Carter has been selected engineer for the Himyar Coal Corporation, Hazard, Ky., which is preparing to put in a large electrically operated coal mining plant. J. B. Allen is manager.

The Dawson Springs Company has been organized to establish a $25,000 bottling plant at Dawson Springs, Ky. L. A. Tucker, Edward F. Webb, Slayden Phillips and others, are interested.

John Tipton, Catlettsburg, Ky., is in charge of machinery purchases for the National Interior Finish Company, which is establishing a wood-working plant at Huntington, W. Va. E. M. Byrne is general manager of the company.

J. J. Kasper, Madison, Ind., has information regarding the establishment of a $50,000 catsup plant.

The Pioneer Pole & Shaft Company, which has removed its factory from Oakland City, Ind., to Evansville, Ind., has begun the erection of its buildings.

The Cumberland Stave & Heading Company, Livingston, Tenn., is planning the establishment of a large mill at Harriman, Tenn., it is reported.

The Fountain Head Industrial School, Sumner County, Tenn., has been incorporated by Roy W. Edminster, Edna Edminster, Barden N. Mulford and others.

J. T. Deering, Chattanooga, Tenn., is organizing the Cleveland Gas Generator Company, Cleveland, Tenn., which will erect a manufacturing plant at Cleveland.

The Simplicity Shade Adjuster Company, now operating in Indiana, has announced its intention of erecting a plant at Memphis, Tenn.

The St. Elmo Business League, St. Elmo, a suburb of Chattanooga, Tenn., has plans for the construction of a water plant at a cost of $20,000. L. W. Bates is mayor of St. Elmo.

The Cincinnati, New Orleans & Texas Pacific Railway, Cincinnati, Ohio, will build a reinforced concrete structure at Chattanooga, Tenn., for use as machine and repair shops, with a capacity of 12 passenger coaches a month. A considerable number of machine tools will be needed, as the company has announced that the present capacity will be inadequate.

J. W. Bouchard, Nashville, Tenn., has purchased the machine shop of S. Hartsfield & Son, Murfreesboro, Tenn., and took charge February 1.

C. W. Kendle, Huntington, W. Va., is buying machinery for a glass plant.

The shop of the Mingo Roofing & Sheet Metal Company, Williamson, W. Va., was recently burned.

The plant of the Spengler Sash & Door Company, Vicksburg, Miss., was burned recently with $40,000 loss.

The Lincoln Furniture Mfg. Company, Lincolnton, N. C., has been incorporated with a capital stock of $50,000 and plans a building and machinery to cost about $20,000. This company expects to manufacture about three cars of furniture a week. D. E. Rhyme is president; H. S. Robinson, secretary-treasurer, and M. W. Shook, manager.

Birmingham

BIRMINGHAM, ALA., February 2, 1914.

Feeling in the machinery line continues cheerful and there is a gradual improvement in actual business owing to increase of activity in structural lines. Transactions are largely for engines, boilers and gasoline engines. There will be a large amount of railroad work in Alabama this year which will call for a variety of supplies. The sale of electric motors is reported as fair. The mines and sawmills are in the market for scattered wants only.

The Birmingham Railway, Light & Power Company has appropriated $1,400,000 for betterments during the year. The major portion is to be expended on enlarging the gas plant. Additional electrical equipment will be installed in the power house, etc.

The Caldwell-Watson Foundry & Machine Company, Birmingham, which suffered a $50,000 fire recently, will rebuild. Partial insurance was carried.

T. M. McClellan, president of the Birmingham Paper Company, and associates, have organized a company with $25,000 capital to establish a plant for manufacturing paper boxes and cartons in Birmingham.

The Le Garde Lime & Stone Company, Gadsden, Ala., will rebuild two kilns, recently burned.

W. H. Daniel, of the Daniel Mfg. Company, Birmingham, is considering establishing a plant to manufacture a patented water cut-off device at Gadsden, Ala.

The White Swan Laundry Company, Birmingham, has plans prepared for the erection of a $100,000 laundry. Edwin C. Stafford is secretary and treasurer.

The Mobile Steel Works, recently incorporated, has increased its capital stock from $25,000 to $50,000. Walter E. Voight, New York, is president.

The Southern States Iron Company, Savannah, Ga., has been incorporated, and will manufacture corrugated iron roofing. H. Fulenwider, Birmingham, Ala., is president.

The Birmingham-Tuscaloosa Railway & Securities Company has issued $600,000 of six per cent. three-year notes, the proceeds of which are to be expended in electrifying the belt street railway, at Tuscaloosa, Ala., construction of a power plant at Tuscaloosa, etc.

St. Louis

ST. LOUIS, MO., February 2, 1914.

Developments of the most favorable character continue, and while the volume of business is rather gradually increasing there are evidences accumulating of a more decided movement with the progress of the year. Inquiries are coming in in larger numbers and there are more reports of new enterprises planned, either positively or tentatively, while existing industries are beginning to feel that extensions are not only possible but really advisable under the development of confidence. Reports from the outlying territory are of satisfactory local financial conditions, with money becoming easier and capitalization of enterprises much less difficult. For the most part transactions are for single tools and there are no large lists appearing as yet, but such are expected by dealers, who are becoming decidedly optimistic.

The Hummershein Lumber Company, St. Louis, has increased its capital stock from $100,000 to $150,000 for the purpose of increasing its operating capacity.

The Wassmann & Miller Automobile Company, St. Louis, has been incorporated with a capital stock of $12,000 to engage in automobile repairing, etc.

The Ford Motor Company, Detroit, which is building a branch assembling plant in St. Louis, will install in the St. Louis plant sufficient equipment to assemble 12,000 automobiles yearly.

The Lorraine Lumber Corporation, St. Louis, has been incorporated with a capital stock of $18,000 by A. B. Boller, P. Ziegenfuss and L. Boller, to install mill equipment.

The Liberty Foundry Company, St. Louis, has bought additional ground for the purpose of extending its plant.

The Sanitary Shade & Specialty Company, St. Louis, has been incorporated with a capital stock of $12,000 by Lucius E., Merel G. and Cyrus B. More.

The Kant-Rip-R-Wad Comfort Company, St. Louis, has been incorporated with a capital stock of $50,000 by E. F., J. S. and J. N. Touchstone and J. C. Motter, Dallas, Tex., to manufacture cotton goods.

The Forrester-Nace Company, Kansas City, Mo., has increased its capital stock from $30,000 to $100,000 for the purpose of increasing its equipment for the manufacture of boxes.

The Burlington Overall Mfg. Company, Kansas City, Mo., has been incorporated with a capital stock of $50,000 by Charles Kabaker, Hyman Nathan and Nicholas Abramson.

The Mystic Chemical Company, Kansas City, Mo., has been incorporated with a capital stock of $50,000 by Charles S. Sims, George E. Chambers and James H. Hunter, and will manufacture chemical products.

The Hawkeye Pearl Button Company, Muscatine, Iowa, has obtained permission to use $40,000 of its capital in a button-making plant at Clinton, Mo.

The Empire District Electric Company, Joplin, Mo., has asked permission of the Missouri Public Service Commission, at Jefferson City, to issue bonds for $120,000, to be used in adding equipment to its plant at Joplin.

The Western Motor Company, Kansas City, Mo., has been incorporated with a capital stock of $15,000 by John Scripps, Fred C. Bader and Asher C. Jones, to equip a repair shop, garage and motor manufacturing plant.

The Electric Light Commission, Festus, Mo., will install one 175-hp. boiler of 150 lb. pressure and other plant equipment.

The Mountain Grove Ice & Electric Company, Mountain Grove, Mo., will add two boilers and other equipment to its plant.

The Pure Ice & Cold Storage Company, East St. Louis, Ill., will erect an ice plant and will equip with machinery to cost about $25,000.

The Central Brewery Company, East St. Louis, Ill., has begun work on an addition to its plant, in which will be placed equipment of a capacity of 150 bbls. per day.

The Illinois Central Railroad will shortly begin the construction of a $300,000 freight depot and warehouse requiring the installation of a considerable quantity of freight handling mechanical equipment.

The Rowe Mfg. Company, Galesburg, Ill., has been incorporated with a capital stock of $80,000 by A. V. Rowe, Harry C. Nelson and J. R. Harrison.

The Armstrong Engineering Company, Taylorville, Ill., has increased its capital stock from $15,000 to $30,000 for the purpose of adding new construction equipment, etc.

The Litchfield Creamery Company, Litchfield, Ill., has been incorporated with a capital stock of $15,000, and will add equipment to present plant apparatus owned by the incorporators.

The J. S. Nichols Company, Lake City, Ark., has been incorporated with a capital stock of $10,000 by J. S. Nichols and others, and will equip a cotton compress and ginnery.

Jean Reutlinger, Brockman Produce Company, Little Rock, Ark., has plans for the installation of an ice and cold storage plant to cost with equipment about $50.000.

The Desha Land & Timber Company, Arkansas City, Ark., has been incorporated with a capital stock of $200,000 by H. M. Lewis, Wallace Townsend, S. S. Ford and J. L. Parker, to equip and operate lumber mills, etc.

The Detroit-Arkansas Logging Company, Arkansas City, Ark., has been incorporated with a capital stock of $100,000 by B. J. Terry, J. Bernhardt and others, and will install equipment.

The W. A. Edwards & Son Company, Batesville, Ark., has been incorporated with a capital stock of $25,000 by W. A. Edwards and others, and will do a general manufacturing business.

The Sandberry Interior Finish Company, Little Rock, Ark., has been incorporated with a caapital stock of $15,000 by A. Sandberry, Axel Williams and R. T. Bryson, to operate a wood-working plant.

The City Market & Arcade Company, Little Rock, Ark., will install refrigerating equipment to cost about $15,000.

An addition to cost about $75,000, with equipment, will be installed by Swift & Co., of Chicago, in connection with their plant at Oklahoma City, Okla., chiefly for handling poultry.

The city of Buffalo, Okla., is planning the installation of a waterworks plant to cost about $50,000.

The water and light commissioners, Canton, Miss., will install a high-speed automatic engine, centrifugal pump and air compressor. John T. Sharp is superintendent of the plant.

The Booneville Waterworks Company, Booneville, Miss., has plans for installing an ice plant of 10-ton capacity.

The Lyon Bros. Lumber Company, Heidelberg, Miss., has plans for the early construction and equipment of a mill at Paulding, Miss.

A hardwood mill of 50,000 ft. daily capacity is to be equipped at Wesson, Miss., by the Eastern Hardwood Mfg. Company.

The Western Tablet Company, St. Joseph, Mo., manufacturer of writing and school tablets, etc., has let the contract for an addition, 70 x 300 ft., costing about $20,000, which will double the company's output.

The Oklahoma Iron Works, Tulsa, Okla., will build a new machine shop, 80 x 240 ft. All equipment will be of the latest improved type. A. B. Patterson is superintendent of construction.

The Henryetta Pressed Brick Company, Henryetta, Okla., has been incorporated with a capital stock of $15,000 by C. B. Gotwals, Muskogee, and S. J. Allen, of Wainwright.

The Southern Macaroni Company, New Orleans, La., has been incorporated with a capital stock of $40,000 by Leon and Albert Tujague and Louis Robichaux to manufacture macaroni and other food products.

Texas

AUSTIN, TEXAS, January 31, 1914.

The machinery and tool trade continues to improve gradually but steadily. Outside capital is again becoming an active factor in promoting industrial projects as a result of improved financial conditions. A number of irrigation projects in southwest Texas give promise of a good demand for irrigation machinery.

The New Braunfels Brewing Association, New Braunfels, has started work on its brewery, which it expects to have in operation by June 1. The company has a capital stock of $60,000. John F. Holm is president.

Work is progressing rapidly on the 12-stall round house, machine shops and other structures of the Santa Fé Railway at Brownwood.

The Central Texas Ice Company, Mexia, will increase its capital stock from $60,000 to $100,000 for the purpose of building ice plants at other places in central Texas. R. Horlock is president.

The new power house which the Quanah Light & Ice Company is erecting at Quanah is nearing completion. Four Diesel engines of 250-hp. each will be installed.

The Lutcher & Moore Lumber Company, Orange, will erect a large factory for the manufacture of wood preservatives. Alex. Schaumann will be in charge.

The Farmers' Union of Jackson County will erect a cotton gin at Edna this summer.

The City Council of Cotulla has granted a 25-year franchise to E. B. Zachry for an electric light plant. Construction work will be started within 90 days, and the plant must be in operation within a year.

The Dallas Northwestern Traction Company has been formed at Dallas with a capital stock of $500,000 for the purpose of constructing an electric interurban railway between Dallas and Wichita Falls. The principal incorporators are E. P. Turner, Ben B. Cain and L. S. Thorne, all of Dallas.

E. E. Smith, of Gonzales, has purchased the Waelder waterworks plant and system and will enlarge and improve the plant.

The Denton Steam Laundry, Denton, has been organized with a capital stock of $20,000. The incorporators are James L. Roxburgh, Lee Zumwalt and J. J. Malachlan.

The Eckhardt Gin Company, Yorktown, has been incorporated with a capital stock of $16,000 to erect a large cotton gin. The incorporators are C. J. Eckhardt, R. H. Eckhardt and Gus Eckhardt.

The Winters Light & Power Company, Winters, has increased its capital stock from $10,000 to $15,000 and will enlarge its plant.

Bids will be received by the city clerk, El Paso, Texas, until February 12 for furnishing a steam-driven plunger pump with a capacity of 4,000,000 gal.; one or more power pumps, with a capacity of about 3,000,000 gal.; centrifugal pumps, air compressors, etc.

The Pacific Northwest

SEATTLE, WASH., January 27, 1914.

With the resumption of operations by practically all the lumber mills in Pierce and Snohomish counties and the large mills in Bellingham, conditions in the Northwest are considerably brighter. In Pierce County alone mills employing more than 600 men have begun operations in the last week, and it is believed that every lumber mill in that county will be in full operation before March 1. Tacoma lumber men announce unofficially that inquiries totaling some 100,000,000 ft. have been made through them, mainly from the car companies furnishing the Harriman lines. Tacoma mills will furnish a large part of this demand. The lumber mills in and around Everett have practically all reopened and market conditions in that locality are good. The shingle market is improving, an advance of 5 cents a thousand being made in the last ten days. All the large logging camps in the Northwest, whose owners are members of the Pacific Coast Loggers' Association, are still closed, and it is not known definitely when the camps will resume cutting. However, it is not believed it will be much longer, as the surplus of logs on Puget Sound is reported unusually small.

One of the great and far-reaching results of the passage of the Alaska Railway bill is the increase of business which Seattle has with the great northland. Seattle's trade with Alaska is already estimated at $72,000,000, and it is believed by those who have studied the situation that the construction of the Alaskan railroad will multiply that business many times. The movement of freight to interior Alaska points will soon begin, and several large orders for machinery for that district are being completed, while large shipments of mining machinery have already been dispatched for southeastern Alaska. Oriental business is also a factor of some importance, the steamer Panama Maru, leaving Tacoma January 19, carrying electrical machinery valued at over $87,000 and flour mill machinery at about $13,000. Many orders are also coming from the interior, where numerous canneries, packing houses, creameries, etc., are being fitted up.

C. C. Moore & Co., Seattle, Wash., have been awarded contract by the board of public works for supplying machinery and installing it in the steam auxiliary plant to the Cedar River lighting system, of Seattle, on a bid of $154,500. The company is given 200 days in which to complete the contract, and will be paid $250 for each day the plant is ready ahead of the prescribed date. This plant, when completed, will add 5000 kw. to the municipal light and power system of Seattle.

The Seattle-Astoria Iron Works, Seattle, has been incorporated with a capital stock of $200,000 by John Fox, N. Troyer and F. C. Fox.

The Western Mills Company, Seattle, has been incorporated with a capital stock of $10,000,000 and will at once begin developments in the Puget Sound country. A site is now being selected for the location of a large plant, which will include the manufacture of lumber and by-products on a very large scale. A chemical laboratory will be erected on the mill site and experts in commercial chemistry employed for testing and utilizing

forest products. A power development project will be undertaken and an hydraulic system installed. The company plans to build the largest plant of its kind on the Pacific Coast. W. B. Wolffe, of the Assets Financing Company, Seattle, and U. K. Loose, president of that company, will be at the head of the lumber company. It is stated that actual construction work will begin early in the spring.

The Edison Shingle Company, Edison, Wash., has been incorporated with a capital stock of $5000, where a shingle mill will be erected. Petrus Pearson, E. A. Hinkston, and others, are interested.

The Rucker Bros.' shingle mill at Lake Stevens, Wash., was recently destroyed by fire with a loss of $23,000, covered by insurance. The mill will be rebuilt at once. Everett, Wash., is the head office of the company.

The Cannon Mill Company, Wenatchee, Wash., will construct a large lumber plant. J. E. Van Cleve, contractor, of that city, has been awarded the contract for the erection of the mill buildings.

The Capital City Iron Works, Olympia, Wash., has been incorporated with a capital of $25,000 by J. Bamford and F. A. Nickolson.

The Pacific Iron Works, Portland, is having plans drawn for a new plant on East Twenty-ninth street.

The mill and yards of the Portland Lumber Company, Portland, Ore., recently suffered a $150,000 loss by fire. The plant of the company is valued at $500,000, and George K. Wentworth, president of the company, states that the loss will be at once repaired. Much valuable machinery was burned.

The Eugene Fruit Growers' Association, Eugene, Ore., has increased the capital stock of the organization and will at once double the output of the cannery and evaporator. The improvement will cost approximately $15,000.

The Oregon Power Company, Eugene, Ore., is calling for figures on a large fuel storage house and conveyor system between its plant and the Booth Kelly sawmill.

A site has been secured and capital is available for the construction of a creamery and artificial ice plant in Burley, Idaho. Colonel J. E. Miller, of that city, is back of the movement.

The Roberts Milling Company, Roberts, Idaho, has recently been incorporated with a capital stock of $10,000. The company contemplates the immediate erection and operation of a large flour mill. J. W. Evans, William Stibal, and others, of Roberts, are the incorporators.

The Rhodes Harvester Company, Ltd., Moscow, Idaho, is negotiating for a site in that city on which it plans to erect a large factory.

The Boise Gas, Light & Coke Company, Boise, Idaho, announces that it will spend $12,000 in improving and extending its plant. Work will start as soon as the weather permits.

George H. Kester, Lewiston, Idaho, is preparing to install a large rock crushing and gravel plant.

El Monte, Cal., has voted for a $46,250 bond issue for constructing a municipal water system. The city will purchase a local private plant for $2500, leaving $43,750 for development purposes.

New England

BOSTON, MASS., February 2, 1914.

The trend of business continues upward. From every side come expressions of confidence, and in a large percentage of cases the basis consists of actual orders and increased inquiries. Some of the machine tool builders have received most encouraging orders in the last 10 days. In certain cases new business was transacted by wire, and in numerous instances orders are for quick shipment, the need of new equipment apparently being imperative. The mercantile agencies state that inquiries as to credits are increasing each week in a very considerable percentage; in fact much beyond the increase which might be attributed to the season. The Connecticut industrial stocks are rapidly advancing both in price and demand. According to the quotations on the Hartford stock exchange there is hardly an exception to this rule.

The Mason Brush Works, Worcester, Mass., manufacturer of mill and machine brushes, has taken additional space in its building in order to make a large increase in its manufacturing capacity. A new feature of the business will be the manufacture of solid back brushes of all descriptions.

The Continuous Zinc Furnace Company, Hartford, Conn., owner of the Johnson electrothermic process, which has for several years conducted experiments in smelting complex zinc sulphides, has established a commercial furnace on a small scale at Hartford and has plans for building a full-sized plant, probably in Montana.

The Dunbar Bros. Company, Bristol, Conn., has purchased a tract of land adjacent to its property and proposes to erect an addition.

The Canfield Rubber Company, Bridgeport, Conn., is planning the erection of a four-story addition, 150 x 200 ft., of brick construction.

The Russell & Irwin division of the American Hardware Corporation, New Britain, Conn., has made plans for an additional seven-story factory.

Spier Brothers, New London, Conn., will erect a plant at Fort Neck, 40 x 50 ft., for the manufacture of boilers. The business is now conducted on property owned by the Connecticut Power Company, which the proprietors will utilize for extensive building.

The Canadian business of the Russell-Jennings Mfg. Company, maker of auger bits and braces, has grown so rapidly in the last few years that it has become necessary to operate a Canadian factory. A building has been purchased at St. Catharines, Ont., and machinery and equipment are being installed. Manufacturing operations will commence very soon. Russell-Jennings bits made in Canada will be ready about March 1.

Eastern Canada

TORONTO, ONT., January 31, 1914.

The Canada Cement Company, Montreal, announced that it would close down four of its plants at Lakefield, Marlbank, and Shallow Lake, in Ontario, and Calgary, Alberta. The general slackening up of building and other construction work is given as the cause of the closing.

Fire destroyed the planing mills and lumber yards of A. Coates & Son, Burlington, Ont. The loss is estimated at $30,000.

It is understood that a reorganization of the Abitibi Pulp & Paper Company, Toronto, is now on foot, and that it may be effected within a few days.

The Mount Royal Mfg. Works, 1504 Sussex street, Montreal, was damaged by fire to the extent of $2000.

Templeton Brothers, manufacturers of electric ranges, whose plant was recently destroyed by fire in Toronto, are looking for a site to erect a factory at Brantford, Ont.

J. Frater Taylor, vice-president of the Lake Superior Steel Corporation, Sault Ste. Marie, Ont., announced that his company has decided to let the contract at once for the construction of another open-hearth furnace. This is the first step in the company's proposed scheme to spend upward of $3,000,000 on extensions to its plant.

The New Brunswick Packing Company, Ltd., St. John, N. B., has been incorporated with a capital stock of $99,000, by J. M. Robinson, president, D. F. Pidgeon and others, to carry on a pork packing business.

The Canadian General Electric Company, Peterborough, Ont., is contemplating the erection of electric locomotives at its works. The company will expend $150,000 for that purpose.

The Nyberg Automobile Company will erect a factory in Berlin, Ont., this year. Mr. Nyberg will take immediate steps for the erection of the plant.

It is announced that the Rutenber Company, manufacturer of automobile engines, will erect a factory at Berlin, Ont.

The roof of the Flemming Mill, Hartland, N. B., owned by Nevers & Price, which has recently been remodelled, caved in and some of the machinery was destroyed.

T. McAvity & Sons, Ltd., St. John, N. B., announce that they are prepared to make an immediate outlay of $300,000 on their new plant. The plant will include brass and iron foundries, etc.

The Viger-Foster Valve Company, Ltd., Montreal, has been incorporated with a capital stock of $250,000 by Edgar R. Parkins, William Taylor and others, of Montreal, to manufacture engines and other machinery, etc.

The Canadian Halley's Motors, Ltd., Montreal, has been incorporated with a capital stock of $10,000 by Lawrence MacFarlane, Charles A. Pope and others, of Montreal, to manufacture motor lorries, automobiles, etc.

The John ver Mehr Engineering Company, Ltd., Toronto, has been incorporated with a capital stock of $1,900,000 by John ver Mehr, William Storrie and others, of Toronto, to conduct a jobbing foundry and to manufacture farm implements and machinery.

The Boyd Pressed Brick Company, Ltd., Milton, Ont., has been incorporated with a capital stock of $200,000 by Robert Boyd, Samuel E. Brandon, William N. Scott and others.

The Eureka Smoke Consumer Company of Canada, Ltd., Toronto, has been incorporated with a capital stock of $10,000 by Sydney H. Stott, Melville S. Gooderham, Thomas Herbert Barton and others, of Toronto, to manufacture boilers, smoke consumers and machinery of all kinds.

The Hill-Willcox Patents Company, Ltd., Windsor, Ont., has been incorporated with a capital stock of $40,000 by Walter C. Hill, George B. Willcox and others, to manufacture patented articles.

The Trenton Cooperage Mills, Ltd., Trenton, Ont., has been incorporated with a capital stock of $100,000 by William Stewart, Thomas S. Stewart, Harold E. Walker and others, of Montreal, to manufacture lumber, etc.

Villeneuve Limited, Montreal, has been incorporated with a capital stock of $90,000 by Joseph A. Villeneuve, Joseph I. Dupre and others, of Montreal, to manufacture terra cotta, sandstone pipes, pottery, etc.

The Gibson-Kemp Company, Ltd., London, Ont., has been incorporated with a capital stock of $40,000 by Willie H. Gibson, Harold R. Kemp and others, of London, Ont., to manufacture vacuum clothes' washers, etc.

Western Canada

WINNIPEG, MAN., January 31, 1914.

The outlook has brightened up considerably. The downward trend of the money market in England, on which investments in Canada so much depend, has stimulated confidence, and it is now predicted that there will be a great amount of industrial expansion throughout Western Canada this year. At the moment the movement of machinery is rather quiet, but not much more so than usual at this season, as not much building or repair work is carried on in January and February.

The Gilbert Hunt Mfg. Company, Maple Creek, Sask., capitalized at $700,000, will start work on the erection of a plant to cost between $75,000 and $100,000 in the spring. It will manufacture farm machinery.

It is stated that W. C. Bond, 304 Pemberton Building, Victoria, B. C., will start work shortly on the proposed brass foundry at Coquitlam, B. C., provided water and electric power are given.

The Kootenay Mills, Ltd., Kaslo, B. C., are considering the rebuilding of its sawmill, sash and door factory. Modern machinery will be installed. R. H. Fulton, Walter Scott Building, Moose Jaw, Sask., is secretary.

R. C. Desrochers, secretary of the Department of Public Works, Ottawa, Ont., will receive bids until February 11 for three standard passenger elevators and one freight elevator, complete with motor-generator sets, to be used in Calgary, Alberta. Plans are at the offices of Leo Dowler, architect, Calgary; H. E. Matthews, architect, Winnipeg, and at the department in Ottawa.

The Mill Creek Cold Storage Company, Ltd., Edmonton, Alberta, has been incorporated with a capital stock of $50,000. The company will take over a meat packing plant and will remodel it.

The Thompson-MacDougall Company, Ltd., Winnipeg, has been incorporated with a capital stock of $250,000 by H. MacDougall, C. H. Booth and others, of Winnipeg, Man., to manufacture building supplies, etc.

The Nickelson Drug & Chemical Company, Ltd., Winnipeg, Man., has been incorporated with a capital stock of $100,000 by A. Nickelson, B. Murray and others, to manufacture medical apparatus of all kinds.

The Winnipeg Laundry, Ltd., Winnipeg, Man., has been incorporated with a capital stock of $50,000 by A. Davidson, J. A. Davidson and others, of Winnipeg, to conduct a steam laundry and dyeing business.

The United Farmers of Alberta at a meeting held in Lethbridge, Alberta, announced that 50 new elevators will be erected this year.

The Celtic Flax Company, Ltd., Beausejour, Man., has been incorporated with a capital stock of $350,000 by James C. Scott, Winnipeg, James L. Turner and others, of Beausejour, Man., to manufacture and deal in flax, etc.

W. W. Carruthers, Ltd., Winnipeg, Man., has been incorporated with a capital stock of $60,000 by William W. Carruthers, William J. Usher and others, of Winnipeg, to manufacture and deal in oils, etc.

Government Purchases

WASHINGTON, D. C., January 29, 1914.

Bids will be received by the Bureau of Supplies and Accounts, Washington, until February 24, schedule 6329, for an electric traveling hoist for Washington; schedule 6332 for an acetylene outfit for Norfolk; schedule 6338 for electrical-driven air compressors, f.o.b. works; schedule 6337 for a hydraulic pump for Washington; schedule 6339 for a turbo-generating set, converging from 5 kw. to 10 kw., f.o.b. works; schedule 6344 for worm-geared chain blocks of ½-ton, 1-ton and 5-ton capacity for Brooklyn; schedule 6351 for a trolley hoist for a 5-in. gun for Brooklyn.

The Isthmian Canal Commission will receive bids until February 21 under canal circular 826 for furnishing: Class 1, four complete sandblast equipments; circular 824A, for tackle blocks.

Bids will be received by the supervising architect, Treasury Department, Washington, until February 10 for furnishing and erecting a 500-hp. water-tube boiler for Bloomington, Ill.

Bids were received at the Bureau of Supplies and Accounts, Navy Department, Washington, January 27 for supplies for the navy yards as follows:

Schedule 6202—Steam Engineering

Class 64, Puget Sound—One simplex vertical pump—Blake & Knowles Steam Pump Works, $1025 and $860; Warren Steam Pump Company, $806; M. T. Davidson Company, $1080 and $850.

Class 64, Alternate—F.o.b. works—Blake & Knowles Steam Pump Works, $975 and $820; George S. Fowler, informal, Warren Steam Pump Company, $760; M. T. Davidson Company, $1020 and $809.

Schedule 6240—Construction and Repair

Class 111, Norfolk—Two ventilating blowers—W. I. Cheyney, $375; Diehl Mfg. Company, $285 and $235; National Electrical Supply Company, $242; B. F. Sturtevant Company, $317; Westinghouse Electric & Mfg. Company, $282.40.

Abstract of proposals for furnishing and erecting steel lock gates and bear-trap leaves for dam No. 28, Ohio River, opened at Wheeling, W. Va., January 16, 1914, by Major J. P. Jervey, corps engineers, United States Army:

Bid 1. Independent Bridge Company.
2. Penn Bridge Company.

Item 1. If separate contract is awarded for each lot: Lot A, lock gates—Bid 1, $38,537.25; 2, $36,862.50. Lot B, bear-trap leaves—Bid 1, $34,461.68; 2, $34,678.80.

2. If both lots are included in one contract—Bid 1, $72,998.93; 2, $71,541.39.

Bids were received January 19 by T. H. Jackson, major of engineers, United States Army, Dallas, Tex., for constructing and erecting two pairs of steel lock gates:

Item 1, for furnishing labor and material and constructing and erecting lock gate; 2, furnishing necessary plant, labor, and material and to fabricate and deliver at Port Arthur, Texas, necessary material for lock gate.

Penn Bridge Company, item 1, $29,700; 2, $18,900.
Chicago Bridge & Iron Works, item 1, $24,200; 2, $17,300.
Milwaukee Bridge Company, item 1, $25,970; 2, $18,070.
Grainger & Co., item 1, $28,000; 2, $18,220.
Independent Bridge Company, item 1, $25,096; 2, $17,976.

Trade Publications

Portable Mine Hoists.—Chicago Pneumatic Tool Company, Fisher Building, Chicago, Ill. Bulletin No. 149. Illustrations and descriptive matter explain the operation of a portable mine hoist that can be used for raising and lowering timber and rock in mine workings. The hoist is designed for mounting on a column in exactly the same way as one of the company's rock drilling machines. If desired, the hoist can be bolted to a timber and used as a stationary one.

Pumps and Air Compressors.—American Steam Pump Company, Battle Creek, Mich. Calendar measuring 8 x 10 in. The lower part of the card is given over to a calendar for the entire year, while in the upper portion views are presented of various types of pumps and the plant in which they are built.

Speed Reducing Gear.—D. O. James Mfg. Company, Chicago, Ill. Bulletin No. 4. Pertains to a line of speed reduction gears for transmitting from 1 to 100 hp., with ratios ranging from 4 to 1 to 1600 to 1. The construction of this gear, which was illustrated in *The Iron Age*, August 10, 1911, is gone into at considerable length, the text being supplemented by a number of halftone engravings of the different types. Instructions for installing the gears are given, together with tables of the standard horsepowers and ratios built. A table of dimensions is included and mention is also made of a line of incased worm gear reductions.

Structural Steel Work.—McClintic-Marshall Company, Pittsburgh, Pa. Calendar. Size, 14 x 21¼ in. Is a Panama Canal calendar, each leaf showing in addition to the dates of the month a view of some portion of the canal. Quite a number of the views show the locks for the gates of which this company furnished 60,000 tons of steel. An illustrated description of these gates and the mechanism installed for operating them appeared in *The Iron Age*, November 21, 1912.

Surface Condensers.—Alberger Pump & Condenser Company, New York City. Bulletin No. 18. Describes a surface condenser which is claimed to embody a number of improvements over the forms now generally employed. The condenser is described at some length with a number of halftone and line engravings, one of the latter showing the various arrangements of openings that can be supplied. Mention is also made of accessories, such as centrifugal and direct-acting condensation pumps, dry air and circulating pumps, steam turbines, cooling towers, etc. All of these are illustrated and briefly described, and a scale showing the relations existing between the absolute pressures and temperatures of saturated steam is included.

Hand Milling Machine.—C. G. Garrigus Machine Company, Bristol, Conn. Folder. Concerned with a hand power machine for handling small machine operations, such as keyseating, hobbing worm gears, profiling, cam cutting, etc. The special features of this machine, which was illustrated in *The Iron Age*, October 2, 1913, are briefly touched upon, and there are views of the machine and some of its parts. A condensed table of specifications is also included.

Grinding Machines.—Challenge Machine Company, Inc., Philadelphia, Pa. Catalogue. Illustrates a line of grinding machines, which are built on the unit principle. These units include a head or bench machine and various arrangements of bases, wheels, guards, etc., it being possible to change the machines for handling various classes of work at will. Different combinations of the several units are shown. In connection with the illustrations, mention is made of other arrangements which can be supplied.

Gas Pumps.—Humphrey Gas Pump Company, Syracuse, N. Y. Bulletin. Refers to a four-stroke cycle pump which is designed to operate on any fuel gas used by internal combustion engines, which has a calorific value above 80 B.t.u. per cubic foot. This pump will take water where the supply is not more than 5 or 6 ft. below the intake valve and pump against a head of from 15 to 35 ft. After a brief account of the invention and development of this pump and a description of the principle upon which it operates, the adaptability of the pump for city water supply and filtration, auxiliary water-power plants, drainage and irrigation projects is touched upon, followed by information on the operation, design and construction. A number of line drawings showing the various arrangements of the pump are included.

Locomotive Cranes.—Browning Company, Cleveland, Ohio. Catalogue. Contains a comprehensive illustrated description of a line of locomotive cranes, which can be equipped to handle a hook block, a lifting magnet, an automatic bucket of any type, a drag scraper bucket, a steam shovel dipper or a pile driver hammer and leads. After the description of the crane considerable space is devoted to engravings of the cranes in use in a number of different situations, the views including cranes in use on the Panama Canal and Catskill Aqueduct.

Nuts and Bolts.—Graham Nut Company, Pittsburgh, Pa. Catalogue No. 7. Covers a complete line of nuts, bolts, screws, rivets and washers, which includes the sizes and styles in most common use. Illustrations of the various pieces are given, together with tables showing all the sizes that can be supplied. A number of tables of useful information and a complete telegraphic code are included.

Sheet Metal Stampings.—Kales-Haskel Company, Detroit, Mich. Folder. Shows a wide variety of sheet metal stampings, including washers, pipe and wire clips, metal cups and shells, springs, card holders, bearing liners, screw machine products, etc. A list of the various sizes of washers which this company regularly manufactures is included.

Combined Punching, Shearing and Rod Cutting Machine.—Union Mfg. Company, New Britain, Conn. Pamphlet. Describes a combined punching, shearing and rod cutting machine, which is made in three sizes for hand operation. The different sizes are illustrated and briefly described with reference to their particular features, after which a description of the general construction of the machine is given.

Air Compressors.—Chicago Pneumatic Tool Company, Fisher Building, Chicago, Ill. Folder No. 90. Conveys at a glance an idea of the wide range of air compressors manufactured, only a few of the 200 types and sizes being illustrated with brief descriptions. The machines illustrated include single, duplex, compound and two-stage machines arranged for steam, belt and electric motor drive.

Power Fans.—B. F. Sturtevant Company, Hyde Park, Boston, Mass. Mailing card. Concerned with a line of slow speed power fans for use in the collection and conveying of material. A view of the rotating element of these fans is presented in a contrasting color, and there is an engraving of a slow speed, low power planing mill exhauster on the address side.

Shop Furniture and Trucks.—Angle Steel Stool Company, Inc., Otsego, Mich. Folder. Contains a number of illustrations of various stools and chairs, which are made in different hights and styles. In connection with each engraving brief mention is made of the construction of the different chairs with tables of the hights in which they are supplied. Mention is also made of two portable trucks, one with sheet steel trays and the other with wooden shelves for conveying tools around the shop. Engravings of steel tables and waste cans are also included.

Mine Lamp.—Scranton Acetylene Lamp Company, Scranton, Pa. Mailing card. Shows a self-lighting acetylene mining lamp, and points out its special features, such as a patent changeable-reflector device, an improved type of valve and stiff brass carbide containers.

Iron Body Gate Valves.—Nelson Valve Company, Chestnut Hill, Philadelphia, Pa. Folder. Concerned with a line of iron body gate valves, which are made in a great variety of sizes and refers to the three tests that are made on the metal, the rough casting and the finished valve. The special feature of these valves is the use of two rocking disks and the other features of the valves are brought out by placing them in circles with arrows leading to the particular part of the valve to which they refer.

Cranes.—Pawling & Harnischfeger Company, Milwaukee, Wis. Bulletin No. 401. Concerned with the company's type H crane, for which the special features of rugged construction, absence of overhung gears and the entire inclosing of gears are claimed. The various parts of the crane are taken up and described at some length, the text being supplemented by a number of halftone engravings.

Ventilating Sets.—B. F. Sturtevant Company, Hyde Park, Boston, Mass. Mailing card. Treats of a line of ventilating sets, which are made ready for operation by simply connecting them to the most convenient lighting circuit. Besides their original use for ventilation, these sets can be used in the factory, office and home, for drying, cooling, furnishing furnace draft and many other purposes. A view showing the size of the five sets as compared with an ordinary desk telephone is included.

Leather Belting.—Graton & Knight Mfg. Company, Worcester, Mass. Pamphlet entitled "Belting Manual." Gives considerable instruction on the care, inspection, use and repair of belting, including directions for lacing belts. A number of rules for the use of belting are given, together with tables of power transmitted by belting and the speeds permitted by good practice. A discussion pointing out the advantages possessed by leather belting as compared with other forms of power transmission is included, together with a brief description of the way in which the belting of this company is manufactured.

Traction Engines.—Ohio Tractor-Roller Sales Company, Brunson Building, Columbus, Ohio. Pamphlet. Deals with a combination traction engine and road roller employing kerosene for fuel. The construction of the engine is described at some length, the text being supplemented by a number of engravings of the different parts. Views showing the several types of traction engine which this company can supply are given, together with a condensed dimension table.

Tool Steels.—Horace T. Potts & Co., 316 North Third street, Philadelphia, Pa. Catalogue. Treats of a line of Swedish tool steels, for which this firm has the sole sales agency for the United States and gives information on their uses and proper treatment. Reproductions in colors of the labels of different brands are given, together with a number of tables of useful information. Mention is also made of a domestic line of machinery steel handled by this firm and a list of stock sizes and tables of extras are given for this also.

Forging Machines.—National Machinery Company, Tiffin, Ohio. Circular. Discusses the use of forged parts in the various industries at the present time and the requirements for an up-to-date forging machine. A view of a heavy pattern forging machine built by this company in a number of sizes is presented. This circular is the first of a series designed to familiarize the user of forging machinery with this type of machine and its use in the creating of a new standard of economy in forging machine practice. An illustrated description of the 4-in. size of this machine appeared in *The Iron Age*, October 2, 1913.

Tool Steel.—Carpenter Steel Company, Reading, Pa. Pamphlet, entitled "A Study of Tool Steels." This is a reprint of a paper read before the Railway Club of Pittsburgh, on a study of the proper hardening and classification of tool steels. It is illustrated with a number of photomicrographs of different steels. A suggested grouping of tools in classes according to tempers is given, with information on the grade of steel to be used and instructions for heat treating it.

Belt Shifting Pole.—Edward Wilbur, 125 Summer street, Boston, Mass. Circular. Deals with the Greenerd belt pole, which is designed for shifting machine tool belts from one step of a cone pulley to another. The pole is made of hardwood with a T-shaped piece of steel for shifting the belt. When not in use the pole rests in a socket which is fastened to the floor.

Calendar.—The Norton Company, maker of grinding wheels, has issued a calendar consisting of twelve leaves measuring 4¾ x 7 in. Each of these leaves contains a reproduction of the company's trademark, the names of the two special brands of grinding wheels it manufactures, Alundum and Crystolon, and the calendar for the current, the preceding and succeeding months. On the back of each leaf is a complete calendar for 1914 and the first half of 1915.

Drilling Machines.—Henry & Wright Mfg. Company, 760 Windsor street, Hartford, Conn. Catalogue. Illustrations and descriptive matter explain the operation of a number of different types of drilling machines which are built with various numbers of spindles. In general, the arrangement of the catalogue is to give one illustration of the various types, with condensed tables of specification for the other styles that can be furnished. Among the machines listed is a sensitive radial drilling machine, which was illustrated in *The Iron Age*, May 11, 1911. One of the special features of all the machines shown is the power transmission system, which consists of an endless belt with two intermediate tension pulleys, that was illustrated in *The Iron Age*, January 11, 1912.

Flue Lining.—Campfield Raggle Block Company, Colonial Building, Richmond, Ind. Folder. Calls attention to an air cell flue lining for improving smoke flues and hot air ducts. Illustrations of the various types of lining, which can be supplied in circular, square and rectangular shapes, with openings extending vertically through them, are included.

Spring Machinery.—Charles R. Barrett Company, 18 East Kinzie street, Chicago, Ill. Pamphlet. Describes and illustrates a line of automatic spring coiling, closing, cutting and looping machinery. These machines are equipped with automatic attachments for coiling, automatically closing both ends and cutting the springs to any desired length at practically the same time. In connection with the engravings of the various types of machines, the range of work handled by each is given. Illustrations showing some of the springs produced by these machines are also included.

Spring Plug Cock.—National Tube Company, Frick Building, Pittsburgh, Pa. Folder. Calls attention to a spring plug cock which is designed to overcome the disadvantages of the ordinary screw plug type. The special feature of the fitting is the use of an inverted plug with a spring at the bottom, which constantly presses the plug firmly against the seat. Instructions on the use of the fitting are given, together with a table of the various sizes which can be supplied, either in all brass, all iron or with iron bodies and brass plugs and springs. Exterior and sectional views of the fittings are also shown. A brief description of this cock appeared in *The Iron Age*, October 23, 1913.

Sheet Metal.—Brier Hill Steel Company, Youngstown, Ohio. Booklet. Size, 4⅝ x 7¼ in.; pages, 165. Is a reference book for the sheet metal industry rather than a catalogue. In addition to giving illustrations, descriptions and tables of the various sheet metal products of the company, it contains considerable accurate reference data, which has been collected from various sources. A glossary of terms, descriptions and processes of the iron and steel industry is included, together with a comprehensive telegraph code and index.

Gas Producers.—Smith Gas Power Company, Lexington, Ohio. Catalogue No. 9. Describes an up-draft producer for bituminous coal and the tar extractor with which it is equipped. The principles underlying the design and construction of the producer are touched upon at some length, and a discussion of the cost for operating a gas producer plant and the advantages of hot and cold gas for regenerative furnaces and producer and water gas for high temperature heating work is included, together with a number of illustrations showing installations. An illustrated description of the largest gas producer in the world, which was built by this company, appeared in *The Iron Age*, January 8, 1914.

Regrinding Valves.—McNab & Harlin Mfg. Company, 55 John street, New York City. Folder. Pertains to a new type of regrinding valve which is made of high grade steam metal. The various features of its construction are briefly touched upon and a sectional view showing the interior arrangement is included.

Gas Water Heater.—Bastian-Morley Company, 548 West Lake street, Chicago, Ill. Pamphlet. Describes and illustrates the Superior gas water heater, which can be used wherever a supply of hot water is wanted. The special feature of the heater is the absence of a pilot light.

Calendar.—The Joliet Works of the Illinois Steel Company, Joliet, Ill., has issued its annual safety calendar. In the upper portion of the calendar a reproduction of the company's safety button is shown, and on the calendar pad at the bottom safety maxims are given.

Bronze Castings and Stock and Dies.—Sandusky Foundry & Machine Company, Sandusky, Ohio. Booklet. Treats of the fluid compressed method of producing bronze castings, which can be made in a number of different sizes and shapes. Among these castings are pinions, gears, piston rings, copper tubes, square and round bars, valves and valve stems, etc. In addition to these castings, others for which this method is not adapted can be produced in the ordinary way. Views are given of a number of castings with brief descriptions of them. Mention is made of a stock and set of dies for threading brass pipe. A view of the die stock is given, together with a brief description of its construction.

Steel Plate Construction.—Treadwell Construction Company, Midland, Pa. Calendar. Each leaf of the calendar, in addition to giving the calendar for the month, gives a list of the various lines of work built by this company, with views of successful operations. These include pipe lines, ladle cars, welded and riveted tanks, smoke stacks, blast furnaces, cooling towers, etc.

Power Pump.—Fred M. Prescott Steam Pump Company, Milwaukee, Wis. Bulletin P-106-25. Contains the results of a duty test made on a 9¼ x 24 in. duplex waterworks power pump, in which an over-all efficiency of 83½ per cent. or a pump efficiency of 92.7 per cent. was secured. An illustration of the pump, together with a brief description of it, is included.

Leather Belting.—Graton & Knight Mfg. Company, Worcester, Mass. Four folders. Refer to a line of leather belting, which is made in a number of different grades for all classes of service. Views of some of the company's products and reproductions of the trademarks of the different brands are given.

Alternating-Current Generators, Electric Fans and Switchboards.—General Electric Company, Schenectady, N. Y. Three bulletins. The first, No. A-4143, which supersedes No. 4847, is devoted to a line of belt-driven alternating-current generators, which are built for either two or three phase windings with voltages ranging from 240 to 2300 and capacities of 50 to 200 kw. No. A-4197 is the company's 1914 catalogue, describing and illustrating a line of electric fans for table, wall and ceiling mountings and some small ventilating outfits. Moisture proof fans with non-corrosive fittings for use on shipboard are mentioned. The last bulletin, No. A-4189, superseding No. 4919, is devoted to small plant direct-current three-wire switchboards for controlling generators of from 10 to 100 kw. where only one machine is installed. A description of the switchboard is given, together with connection diagrams, a diagram showing the position of the various pieces of apparatus and a table of the sizes in which the boards are built.

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